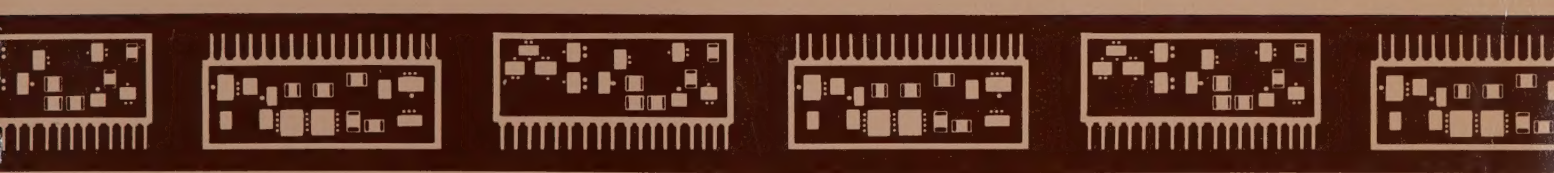
INSTRUCTION MANUAL

8550 SERIES AUDIO DISTRIBUTION AMPLIFIERS



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Grass Valley Group®

8550 SERIES AUDIO DISTRIBUTION AMPLIFIERS

INSTRUCTION MANUAL

Manual Number A90-086357-00/
086358-00

Part Number TP7009-00

Issue Number 4

The Grass Valley Group Inc.
PO Box 1114 Grass Valley California 95945 USA
Tel (916) 478-3000 TRT 160432

A TEKTRONIX COMPANY

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ISSUE STATEMENT

This is Issue 4 of this manual. A general update has been made in this issue.

MANUAL UPDATES

The 8550 Series is a growing line of audio distribution amplifiers. As new models of the series are released, the manual will be updated to include them.

If you have ordered a new distribution amplifier that is not included in this issue of the manual, you are entitled to a new manual that documents it. Please use the postage-paid manual order card included at the back of this manual.

ORGANIZATION OF THE MANUAL

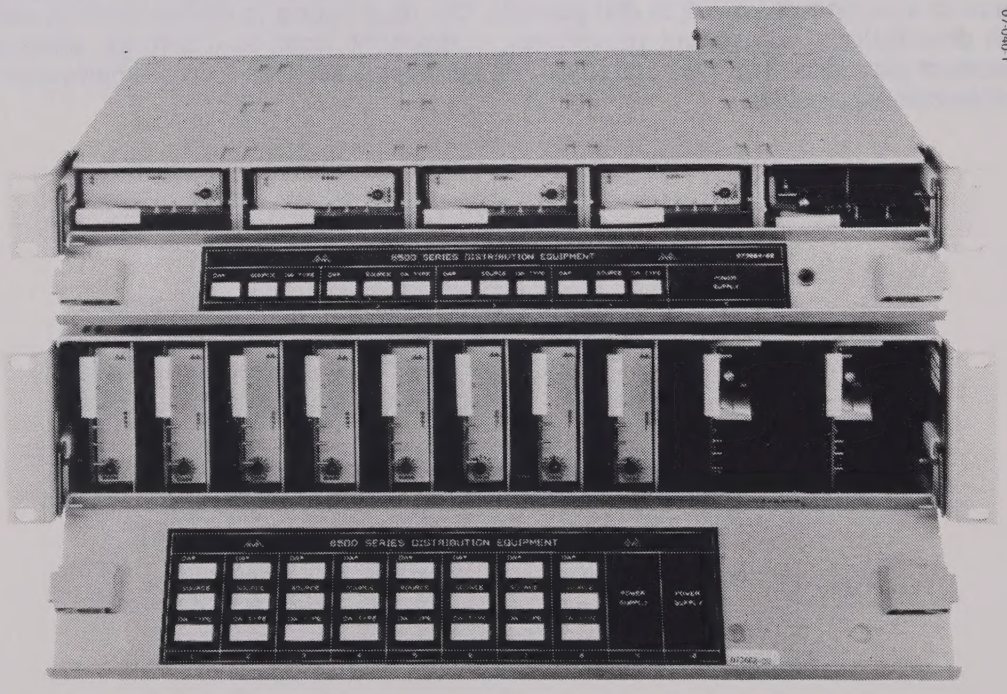
The manual is organized into three main sections: General Information, Tray and Switching Power Supply, and distribution amplifier sections. Specific information about each distribution amplifier is found in a section dedicated to that product. The distribution amplifier sections each include circuit descriptions, adjustment procedures, component location drawings, schematics, and replacement parts lists. The Tray and Linear Power Supply sections include appropriate drawings and replacement parts lists.

INTRODUCTION TO THE 8550 SERIES

The 8550 Series is an all new line of audio distribution amplifiers.
The models feature:

Differential Balanced Bridging Input
Six Balanced Outputs
Low Distortion
Low Noise

The 8550 series offers two standard distribution amplifier trays (see figure1).



07-040.1

Figure 1. 8500 Series DA Trays

The two rack-unit tray can accommodate eight amplifier modules and two completely independent power supplies. The one rack-unit tray accepts up to four amplifier modules and a power supply. Calibrated gain controls allow complete interchangeability of modules. A high-efficiency power supply delivers reduced voltage to all amplifier modules insuring cooler operation.

SPECIFICATIONS

Input Specifications

Impedance (resistive)	>44K Ω
Maximum Common Mode Voltage	±35Volts with +24dBu input
Common Mode Rejection Ratio	>100dB 60Hz to 5KHz >90dB to 20KHz
Maximum Level before Clipping	
Balanced	+36dBu
Unbalanced	+30dBu
Type	Active Balanced

Performance

Frequency Response	
20 Hz to 20KHz for -10 to +24dBu Output Level	±0.05dB
Gain Adjust	
6dB Steps	-12dBu to +30dBu
Variable	±3dB
THD+N	
20Hz to 20KHz, -10 to +24dBu Output Level, 80KHz low pass	<0.030%
IMD 60Hz and 7KHz mixed 4:1	<0.025%
Noise 22.4Hz to 22.4KHz Quasi-Peak response. Unity gain.	
CCIR Weighted	<-82dB
Unweighted	<-86dB
Dynamic Range	>110dB

8551

Output Specifications

Quantity & Type	Six Active Balanced
Maximum Rated Output Level	
Voltage Mode	+24dBu
Into 600Ω	+26dBm
Into 150Ω	+26dBm
Clip Level at 1% THD+N	
Voltage Mode	+28dBu
Into 600Ω	+26dBm
Into 150Ω	+26dBm
Output to Output Isolation, 20Hz to 20KHz	>60dB
DC offset at Unity Gain	<10mV
Impedance	50 Ω ±5%
Gain Match Between Outputs	
Into 600Ω	±0.05dB
Into 150Ω	±0.10dB

Note: In a 1RU frame, all specifications will be met with one shorted output and all other outputs terminated into a minimum of 600 Ω.

In a 2RU frame, all specifications will be met with three shorted outputs (on separate amps) and all other outputs terminated into a minimum of 600 Ω.

INSTALLATION

Introduction

After carefully unpacking this unit and checking the box for power cord and other hardware, examine the box and unit for damage. Any damage should be promptly reported to the carrier.

Rack Mounting

Refer to Figure 2.

There are two mounting trays for the 8550 series DAs: a one rack-unit (1RU) or a two rack-unit (2RU). The mounting trays install in a standard 19-inch (48.26 centimeters) equipment rack. A vertical space of 1RU (1-3/4 inches/4.45 centimeters) in the case of a 1RU tray, or 2RU (3-1/2 inches/8.9 centimeters) for a 2RU tray, and a depth of approximately 18 inches (45.7 centimeters) is required for installing a tray. Install the unit where it can be kept cool. Use of the rear support hardware is recommended.

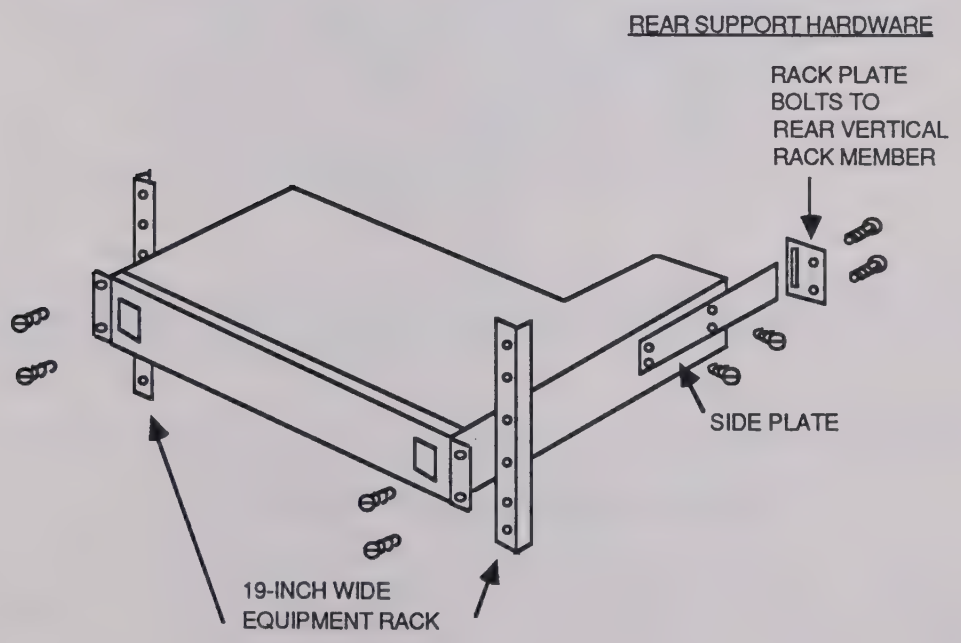


Figure 2. Rack Mounting

Module Locations

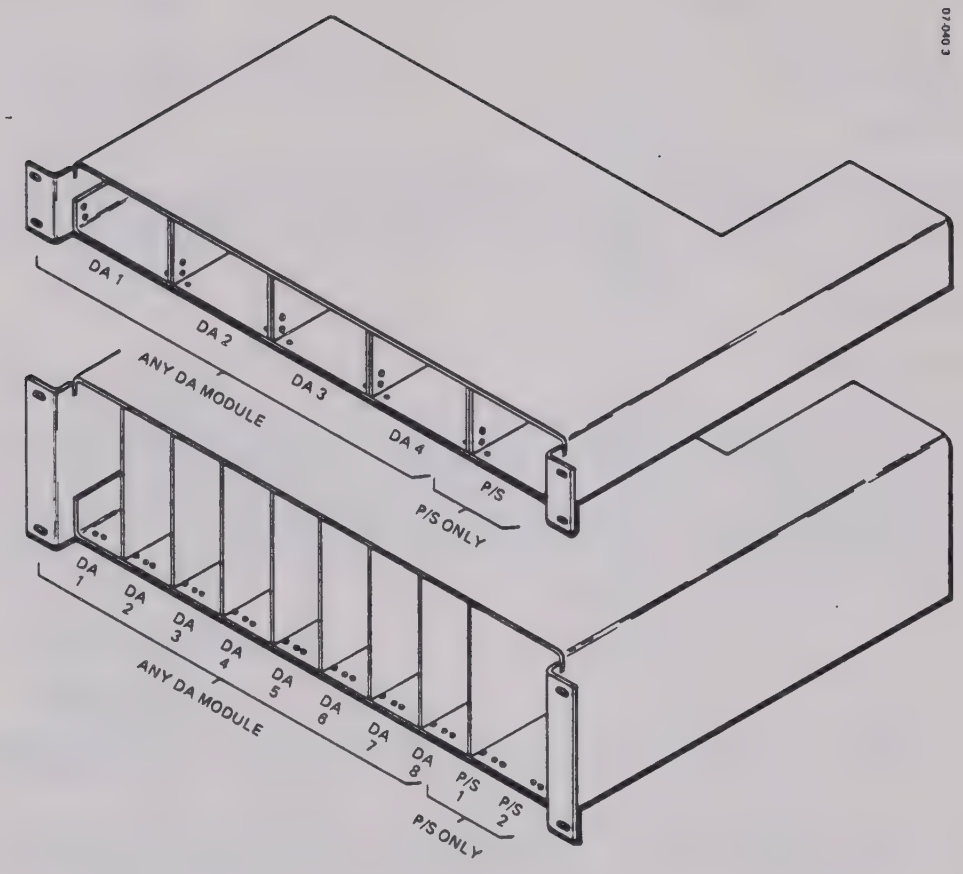


Figure 3. Module Locations In 8550 Series Trays

Cable Connections

Input and output signal routing is through the rear panel connectors. Two input connector sets and six output connector sets are provided for each module. Connectors are removable for easier rewiring and are identified by jack number. See Figure 4.

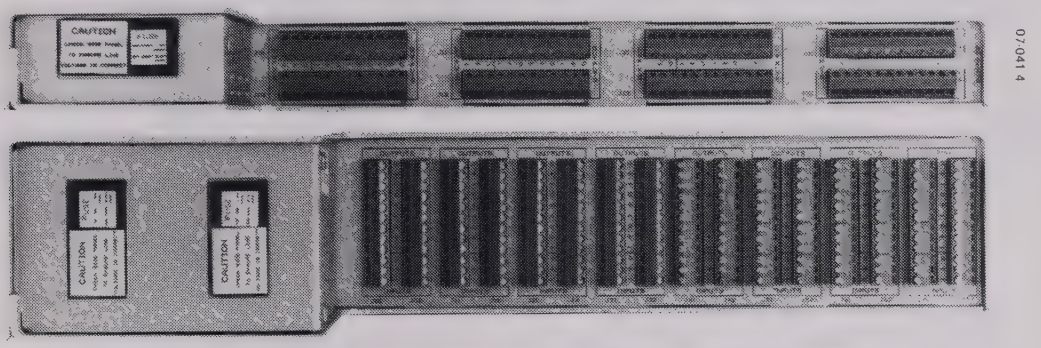


Figure 4. Audio DA Cable Connections

NOTE

The input connectors are not looping type. One set is designed for signal use and the other is reserved for remote I/O (see 8552R section for remote connection information). On the 8551, loop-through may be accomplished by assuring that the 8551 DA is plugged into its slot. (To avoid installing a DA but still effect a loop-through, connect both input and loop-through wires to the same connector.)

Since all the amplifier modules are interchangeable, no designators for signal type are printed on the rear panel. Instead, the front covers are a hinged design incorporating a label on the inside for customer recording of source and DA designations.

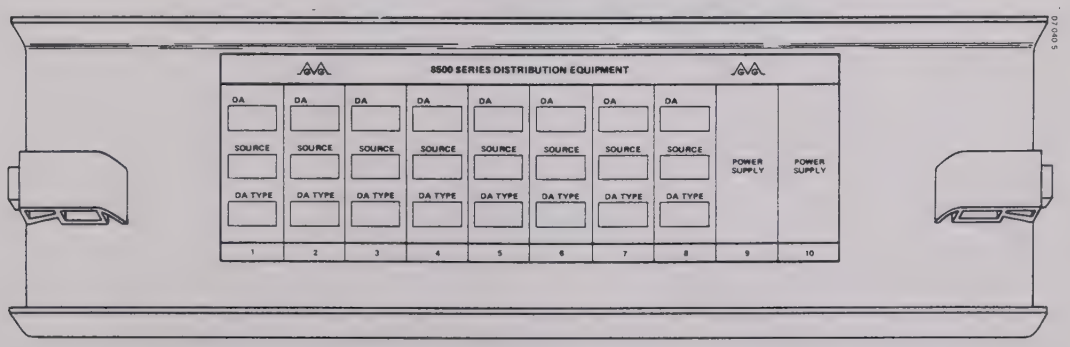


Figure 5. Front Cover Designation Form

Power Connection

Trays come preset to the ordered voltage. Follow these steps:

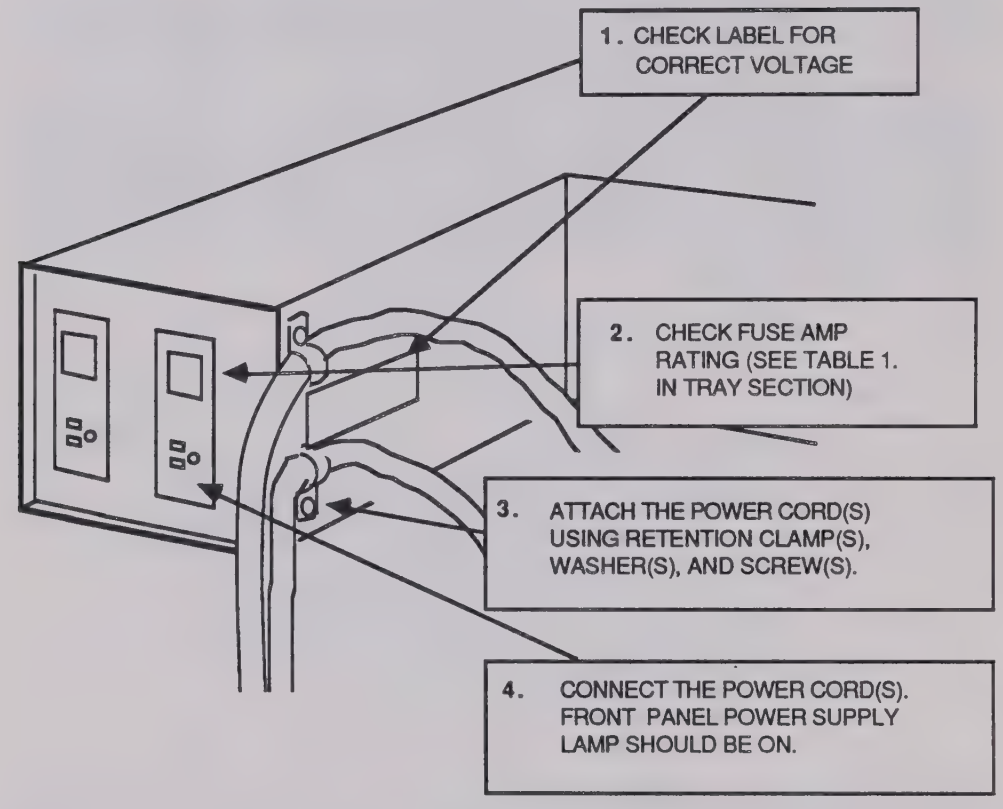

1. CHECK LABEL FOR CORRECT VOLTAGE
2. CHECK FUSE AMP RATING (SEE TABLE 1. IN TRAY SECTION)
3. ATTACH THE POWER CORD(S) USING RETENTION CLAMP(S), WASHER(S), AND SCREW(S).
4. CONNECT THE POWER CORD(S). FRONT PANEL POWER SUPPLY LAMP SHOULD BE ON.

Figure 6. Transformer Assembly

Note: One rack-unit is similar to two-rack-unit pictured above.

REPAIR AND RETURN INSTRUCTIONS

Your Grass Valley Group equipment was designed to be very reliable. In case repairs are needed, however, the following instructions are provided.

If you did not obtain your equipment directly from GVG, please contact the distributor from whom your equipment was purchased (in countries other than the United States, always contact your distributor).

If you obtained your equipment directly from GVG, contact the Modular Products Service Center at (916) 273-8421. The service representative will give you directions for returning the equipment. Ask for a return authorization number (GA #) which will permit the factor to accept your equipment when it arrives.

NOTE

Out-of-warranty repairs cannot begin until a valid purchase order number has been provided

24-hour turnaround time for service can be arranged for an additional charge. It must be requested at the time return instructions are obtained.

Return packaging should be the original shipping carton or another container which will provide adequate protection against shipping damage.

Shipping and related charges are paid by the customer except when GVG returns equipment after warranty-covered repairs are made.

8551 AUDIO DISTRIBUTION AMPLIFIER

INTRODUCTION

The 8551 is a general purpose audio distribution amplifier. The input may be driven balanced or unbalanced. The output supplies a balanced output up to +24dBu and is intended for voltage mode type systems, but may be used to drive lower impedances present in power matched systems.

CIRCUIT DESCRIPTION

Refer to the 8551 schematic drawing D10-066545-00 while reading this description.

Input Amplifier

A balanced signal is applied to connector pins 5, 6, 7, and 8. Signals applied to pins 5, 6 will appear on the negative output while signals applied to pins 7, 8 will appear on the positive output of the DA. The signal is applied to a differential amplifier composed of U200 and U201. The negative input sees a virtual ground at pin 2 of U200, therefore the current is attenuated and converted to a voltage at pin 6. The positive input signal is also treated as a current signal by the presence of negative feedback from U201. Both input signals now see a constant input impedance which offers an actively balanced input stage. Potentiometer R204 adjusts low-frequency common (DC-1KHz) mode while trim capacitor C207 nulls high-frequency common (1KHz-20KHz) mode.

The gain of the input stage is approximately -16.2dB. Attenuated signals present on the input pins of op-amp U200 allow for the presence of large common mode voltages.

Gain Stage

The input signal is attenuated further by the adjustable gain control R500 (±3 dB). The signal is then AC coupled through C500, C501 to pin 3 of U500. This is the only AC coupling in the amplifier. Operational amplifier U500 is used as a stepped gain amplifier. Gain is adjusted by attenuating the feedback through resistor network RN500. Resistor R502 balances DC offsets; C505 and C504 reduce resistor noise present in R502. Resistor R504 keeps the DC offset voltage to a minimum when the gain jumper is removed.

Output Amplifiers

The output of the gain stage is split into two output amplifiers comprised of U100, U101, and the related circuitry. The difference between the two operational amplifiers is that U100 is a non-inverting stage and U101 is an inverting stage. Since the circuitry for both stages is nearly identical, only the non-inverting stage will be described here. Resistors R108, R110 and capacitors C102, C101 comprise a bootstrap circuit which enables the output of U100 to swing above its supply voltages. Resistors R107, R111, R113 and transistor Q101 form a voltage multiplier circuit which slightly turns on Q100, Q102, Q103, and Q104 to establish a small bias current. Transistors Q103 and Q104 drive the output transistors Q100 and Q102. The output signal appears at the junction of the emitter resistors. Feedback to op-amp U100 is taken at this point. The gain is set by R100, R101, and R102. High frequency rolloff is forced by C100 and R100.

Voltage Regulator

Pre-regulated ±16V is supplied to pins 5 and 13 of regulator U1, respectively, and is regulated to ±14.7V and passed through module links R3 and R6 to the distribution amplifier circuitry. Test points are supplied on the front of the module for ±14.7V.

Regulator U1 is a hybrid regulator specifically designed to operate with a low input to output voltage difference. It provides foldback current limiting in the event of abnormal load conditions. Resistors R4 and R5 adjust the output voltage level to ±14.7V.

ADJUSTMENTS

NOTE

This equipment is fully adjusted at the factory. Only front panel controls need to be adjusted to suit your specific system requirements. Internal adjustments are normally not required unless repairs have been made. If the module does not operate, make sure that it is properly installed and power is applied. Then consult the troubleshooting section to assist in locating defective components.

Test Equipment Required

Digital Voltmeter (DVM)	Fluke 8000 Series or equivalent
Oscillator	Tektronix SG 505 or equivalent

Adjustment Procedure

Preliminary Conditions

1. Connect gain jumper to 0dB position.
2. Install module into equipment tray.

Power Regulator Check

1. Monitor +14.7V test point (front of module). Check for +14.7VDC ±150mV.

2. Repeat for -14.7V test point.

Bias Current

1. With no input signal, connect DC voltmeter, positive lead to the emitter of Q100, negative lead to the emitter of Q102.

2. Adjust R113 for a reading of 47 mV ±5mV.

3. With no input signal, connect DC voltmeter positive lead to the emitter of Q106 and the negative lead to emitter of Q105.

4. Adjust R129 for a reading of 47mV DC ±5mV.

Common Mode

1. Connect oscillator for normal balanced input and set oscillator for 1 KHz at 0dBu (.775V).

2. Set amplifier to unity gain by setting gain control on front panel.

3. Set oscillator to 60Hz. Supply the same signal to both inputs (common mode input).

4. Adjust oscillator level to read 10.0V RMS at DA input.

5. Low frequency adjustment: monitor output of DA with digital voltmeter (AC scale). Adjust R204 for less than 100mV.

6. High frequency adjustment: set oscillator to 5KHz. Re-check level for 10V RMS. Adjust C207 for less than 100mV.

7. Repeat steps 3 through 6 if necessary.

TROUBLESHOOTING GUIDE

Power Supply

1. Check for +16VDC at pin 13 and for -16VDC at pin 11 of connector J1. If either is incorrect, check frame power supply. Module connector J1 is numbered 1 to 49 (odd numbers) across front edge and 2 to 50 (even numbers) across rear edge.

2. Check for ±14.7V at test points on front of module. If voltage is incorrect it may be due to excessive loading causing the regulator to go into foldback. The load of the module may be isolated from the regulator by cutting supply traces at R3 and R6. Measure the voltage across C1 and C2. If the voltage remains low, the regulator is defective. If the voltage is correct, there is an excessive current loading in the audio circuitry.
   Audio

1. Be sure the power supply is working correctly prior to trouble shooting other module circuitry (see above).

2. If possible, substitute a known working module to isolate the problem to the module or the frame and external wiring. If the problem is on the module, a quick check with a scope on pin 6 of U100, U101, U500, U200, or U201 will verify these integrated circuits.

3. For correct operation the input must be properly connected in a differential mode. The two output amplifiers are powered by ±16V and are individually fused. Failure of one of the output amplifiers will cause the output to decrease by 6dB.

R E P L A C E M E N T P A R T S L I S T

8551 AUDIO DA
ASSEMBLY NUMBER: 066545-00 ISSUE: S ECN: S094

ITM NO	REFERENCE DESIGNATOR	GVG PART NUMBER	DESCRIPTION MFG CODE/PART NUMBER	QTY
001		046545-04	PCB,AUDIO DA 8551	1
002	[J1]	CF1462-00	CONN,RCPT,50POS 2 ROW PCB MNT AMP/534204-1	1
005	[C6,C7,C110,C111, C113,C114,C200,C201, C202,C203,C502,C503]	CB0132-00	CAP,CER .1UF 20% 50WV Z5U AXIAL GVG/A70-CB0132-00 A1	12
008	[C205]	CB0137-00	CAP,CER 3.9PF +/-.5PF 200WV COG GVG/A70-CB0137-00 A2	1
009	[C204]	CB0139-00	CAP,CER 10PF 5% 200WV COG GVG/A70-CB0139-00 A3	1
010	C103,C09	CB2710-00	CAP,MICA D12 22PF 5% 500WV COD/CDA15ED220J03	2
012	C108,C100,C120,C121	CB2743-00	CAP,MICA D12 430PF 5% 500WV COD/CDA15FD431J03	4
015	[C3,C4,C101,C102, C106,C107,C500,C501, C504,C505]	CB4029-00	CAP,TANT 10UF 10% 20WV GVG/A70-CB4029-00 A1	10
016	[C1,C2,C104,C105]	CB1094-00	CAP,ALUM 100UF 20% 25WV COD/201D101P025SP	4
019	[C207]	CB5021-00	CAP,VAR 2.7-10PF 100WV TOP SEALED GVG/A70-CB5021-00 A2	1
022	[L100,L101]	ZB4029-21	INDCTR,MINI 22UH 5% CUT & FORMED GOW/10M222J-1	2
023	[L1,L2]	ZB4035-21	INDCTR,MINI 68UH 5% CUT & FORMED GOW/10M682J-1	2
025	[U1]	HB9048-00	HYBRID,+/-10V SIP REG GVG/HB9048-00	1
026	[U100,U101,U200, U201,U500]	SC0345-00	IC,LIN NE5534AN 8 DIP GVG/A70-SC0345-00 A2	5
030	[R500]	PD0073-00	POT,500 10% LIN .5X.25 CLA/CM45137	1
031	[R113,R129]	PD2027-00	POT,TRIM CERMET 2K 10% TOP BOR/3329H-1-202	2
032	R204	PD0118-00	POT,TRIM CERMET 20K 10% TOP 4 TURN BOR/3339H-1-203	1
036	[R115,R116,R117, R118,R120,R121,R122, R123]	RB2479-00	RES,4.7 OHM 2% 1/4W MTL FLM GVG/A70-RB2479-00 A1	8
040	[R504]	RV1004-00	RES,1 MEG OHM 1% 1/8W MTL FLM COR/CT4 1M 1%	1
042	[RN100]	HB9071-00	HYBRID,RES NET HI-POWER 25 OHM GVG/HB9071-00	1
046	[R134,R503]	RV3320-00	RES,332 OHM 1% 1/8W MTL FLM COR/CT4 332R 1%	2
047	[R133,R202]	RV5620-00	RES,562 OHM 1% 1/8W MTL FLM COR/CT4 562R 1%	2
050	[R1,R2,R100,R114, R119,R131,R132,R141, R142,R200,R203]	RV1001-00	RES,1K OHM 1% 1/8W MTL FLM COR/CT4 1.0K 1%	11

R E P L A C E M E N T P A R T S L I S T

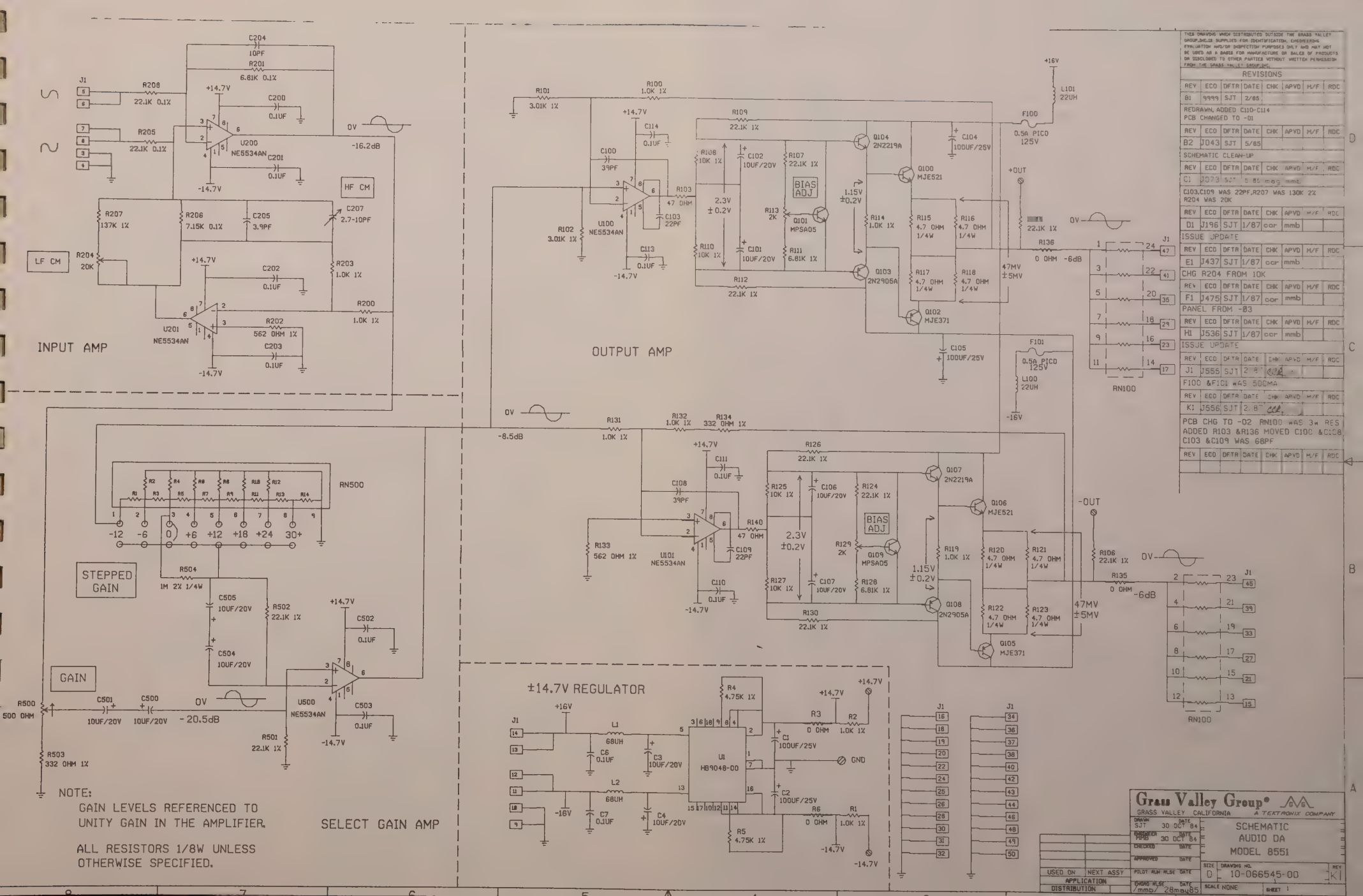
8551 AUDIO DA
ASSEMBLY NUMBER: 066545-00 ISSUE: S ECN: S094

ITM NO	REFERENCE DESIGNATOR	GVG PART NUMBER	DESCRIPTION MFG CODE/PART NUMBER	QTY
052	[R101,R102]	RV3011-00	RES,3.01K OHM 1% 1/8W MTL FLM COR/CT4 3.01K 1%	2
053	[R4,R5]	RV4751-00	RES,4.75K OHM 1% 1/8W MTL FLM COR/CT4 4.75K 1%	2
055	[R201]	RV6811-03	RES,6.81K OHM .1% 1/8W MTL FLM COR/RN55E6811B	1
056	[R111,R128]	RV6811-00	RES,6.81K OHM 1% 1/8W MTL FLM COR/CT4 6.81K 1%	2
057	[R206]	RV7151-03	RES,7.15K .1% 1/8W MTL FLM COR/RN55E7151B	1
059	[R108,R110,R125, R127]	RV1002-00	RES,10K OHM 1% 1/8W MTL FLM COR/CT4 10K 1%	4
061	[R205,R208]	RV2212-03	RES,22.1K OHM .1% 1/8W MTL FLM COR/RN55E2212B	2
062	[R105,R106,R107, R109,R112,R124,R126, R130,R501,R502]	RV2212-00	RES,22.1K OHM 1% 1/8W MTL FLM COR/CT4 22.1K 1%	10
064	[R207]	RV1373-00	RES,137K OHM 1% 1/8W MTL FLM COR/CT4 137K 1%	1
065	[RN500]	RN0028-01	RES NTWK,VARIOUS OHM 14 RES 9 SIP GVG/39-RN0028-01	1
068	[Q101,Q109]	SB8014-00	TRANS,NPN MPSA05 SM SIG TO-92 CSC/MPSA05	2
069	Q104,Q107	SB8006-00	TRANS,NPN 2N4401 SM SIG TO-92 FAI/2N4401	2
070	Q103,Q108	SB8007-00	TRANS,PNP 2N4403 SM SIG TO-92 FAI/2N4403	2
072	[Q100,Q106]	SB7007-00	TRANS,NPN MJE521 PWR 77-03 GVG/A70-SB7007-00 A1	2
073	[Q102,Q105]	SB7006-00	TRANS,PNP MJE371 PWR 77-03 GVG/A70-SB7006-00 A2	2
075		006649-00	HEATSINK,TRANSISTOR,8500	1
076		033642-04	PANEL,LEGEND 8500	1
077		LA1009-00	LABEL,FRT LEGEND 8551 DUR/C70-LA1009-00	1
080		CC2048-00	CARD EJCTR,NYL WHT SNAP ON GVG/A70-CC2048-00 A1	1
081		CF1159-02	CONN,PL HDR 8POS 2ROW PCB MNT 3M/929665-01-08-10	1
082	[0 DB]	JA1009-02	JACK,SHTG BLK PLSTC 2 CNT 3M/929955-06	1
083	[F100,F101]	FB4002-01	FUSE,PICO 1/2 AMP 100% 4HRS 125V GVG/A70-FB4002-01 A2	2
085		PB6045-00	PLSTC,VINYL POINTER SHAFT GVG/B70-PB6045-00 A3	1
086		TA6059-00	TUR PN,.06X.1406 POST .0625 PCB GVG/A70-TA6059-00 A1	5
088		NA4002-00	NUT #4-40 1/16x3/16 H	4

R E P L A C E M E N T P A R T S L I S T

8551 AUDIO DA
ASSEMBLY NUMBER: 066545-00 ISSUE: S ECN: S094

ITM NO	REFERENCE DESIGNATOR	GVG PART NUMBER	DESCRIPTION MFG CODE/PART NUMBER	QTY
			NUT,4-40,.0625X.1875,HEX,ZINC PL	
089		SA1270-00	SCRW,STUD PRS 4-40X.5 PCB CFC/CKFH-440-8	4
090		WA2007-00	WSHR,#4 SPLIT LOCK WASHER,#4,SPLIT RING,ZINC PL	4
095		HB2037-00	HEAT SINK,TO-126 INSUL W/THRM FLM BEQ/K4-60	4
999	D10-066545-00 (SCHEMATIC) C07-066545-00 (COMP. LOCATION) A81-066545-00 (TEST SPECIFICATION) C70-LA1009-00 (PURCHASE SPEC.) C21-033642-04 (DIM.DWG.) C21-006649-00 (DIM.DWG.)	000000-00	REFERENCE DOCUMENTS	0


INPUT AMP
OUTPUT AMP
SELECT GAIN AMP
±14.7V REGULATOR
STEPPED GAIN
GAIN
LF CM
HF CM
BIAS ADJ
NOTE:
GAIN LEVELS REFERENCED TO UNITY GAIN IN THE AMPLIFIER.
ALL RESISTORS 1/8W UNLESS OTHERWISE SPECIFIED.
REVISIONS
Grass Valley Group
GRASS VALLEY CALIFORNIA
A TEKTRONIX COMPANY
SCHEMATIC
AUDIO DA
MODEL 8551
10-066545-00

SIZE	DRAWING NO.	SH	REV
B	07-066545-00	1	K1

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REVISIONS

REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
B1	9999	SJT	17/MAY				
RELEASED, PCB CHANGED TO -01							
C1	J073	SJT	5/85	mag	mmb		
C109,C103,R207 AND R204 VALUE CHANGES							
D1	J196	SJT	1/87	ccr	mmb		
ISSUE UPDATE							
E1	J437	SJT	1/87	ccr	mmb		
ISSUE UPDATE							
F1	J475	SJT	1/87	ccr	mmb		
ISSUE UPDATE							
H1	J536	SJT	1/87	ccr	mmb		
ISSUE UPDATE							
J1	J555	SJT	2/87	CCR	MB		
ISSUE UPDATE							

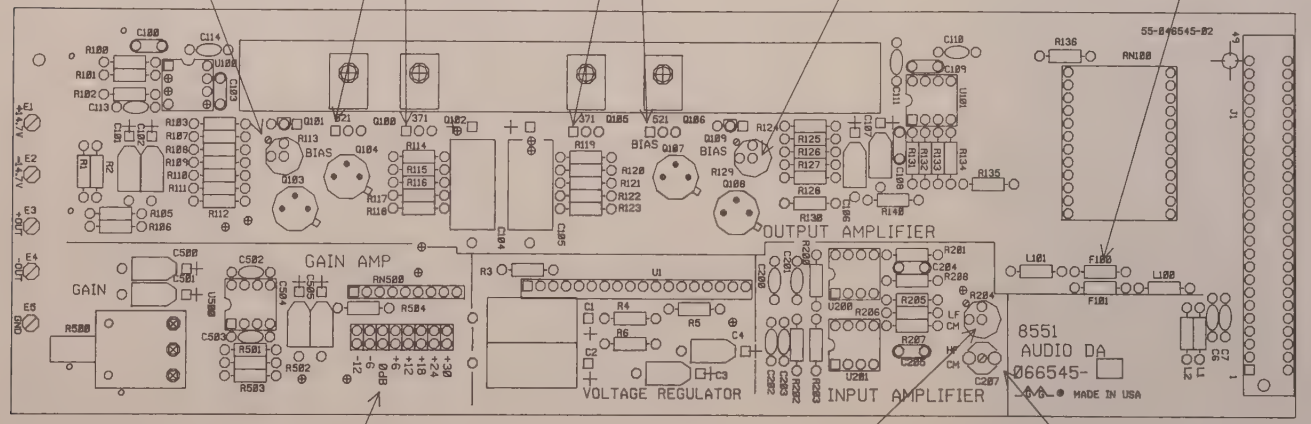
EMITTERS Q100 AND Q102

EMITTERS Q105 AND Q106

OUTPUT AMPLIFIER FUSES F100 AND F101

BIAS ADJUST R113

BIAS ADJUST R129



JUMPER FOR SELECTION OF GAIN LEVEL (+30dB TO -12dB)

LOW FREQUENCY COMMON MODE ADJUST R204

HIGH FREQUENCY COMMON MODE ADJUST C207

REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
K1	J556	SJT	2/87	CCR	MB		
PCB CHG TO -02							

USED ON	NEXT ASSY
APPLICATION	
DISTRIBUTION	

GRASS VALLEY GROUP
GRASS VALLEY CALIFORNIA — A TEKTRONIX COMPANY

DRAWN	DATE SJT 17MAY85
ENGINEER	DATE MMB
CHECKED	DATE
APPROVED	DATE
PILOT RUN RLSE	DATE
ENGRG RLSE	DATE /mmb/ 28may85

COMPONENT LOCATION
AUDIO DA
MODEL 8551

SIZE	DRAWING NO.	REV
B	07-066545-00	K1

SCALE 1:1 SHEET 1 OF 1

INTRODUCTION

The 8552R is a general purpose remote gain audio distribution amplifier. The gain of the amplifier may be controlled remotely, locally or in a summing mode where both remote and local controls have an effect on overall gain. The front panel control labeled MAX GAIN selects the overall gain of the amplifier. Three gain ranges may be selected via a switch on the module. For stereo applications, 2 DA's may be connected to a single remote gain control or combination remote gain and balance control.

The DA is designed to operate in both voltage mode and power matched environments, either 150 ohm or 600 ohm terminations. The DA utilizes a high impedance actively balanced floating input and a low impedance balanced output. The 8552R fits into one cell of the 8550 Audio series 1RU and 2RU frames. Six outputs, one input, and a remote control I/O port are available for each DA at the rear of the frame. The DA supplies all necessary voltages required for the remote gain function. The user must supply a three conductor shielded cable, fixed resistor, and poteniometer to implement the remote function.

SPECIFICATIONS

Input

Type	Active balanced, floating
Impedance (resistive)	>44K Ω
Common Mode Voltage and signal (CMV)	±20V
Common Mode Rejection Ratio (CMRR)	>100dB, 60Hz to 5KHz >90dB to 20KHz
Maximum Level before Clipping (balanced)	+28dBu (with -30dB to +10dB range, max gain of +10dB) +18dBu (with -20dB to +20dB range, max gain of +20dB) +8dBu (with -10dB to +30dB range, max gain of +30dB)

Performance

Frequency Response 20 Hz to 20KHz	±0.05dB
Gain range Total Max Gain indication / range	-30dB to +30dB +10dB/-30dB to +10dB +20dB/-20dB to +20dB +30dB/-10dB to +30dB
Gain tracking between two DA's 20Hz to 20KHz, +10dB setting	<0.1dB over a ±3dB range
Max Gain error between Gain steps	<1%
Phase error between two DA's at 20Khz	<1 degree, <135nS
THD+N 20Hz to 20KHz, 80KHz low pass	< 0.10%

(Specifications-continued)

IMD	
60Hz and 7KHz mixed 4:1	
80Khz low pass	<0.10%
Noise	
22.4Hz to 22.4KHz, rms response	<-70dBu
Dynamic Range	>94dB

Output

Quantity & Type	Six Active Balanced
Maximum Rated Output	
Voltage mode	+24dBu
Into 600 ohms	+24dBm
Into 150 ohms	+24dBm
Clip Level at 1% THD+N	
Voltage mode	+28dBu
Into 600 ohms	+26dBm
Into 150 ohms	+26dBm
Output to Output Isolation	
20Hz to 20KHz	>60dB
DC offset	<10mV
Impedance	50 Ω, ±5%
Gain match between outputs	
Into 600 ohms	±0.05dB
Into 150 ohms	±0.10dB
Maximum Level with	
one shorted output	+24dBu

Note: In a 1RU frame, all specifications will be met with one shorted output and all other outputs terminated into a minimum of 600 Ω.

In a 2RU frame, all specifications will be met with three shorted outputs (on separate amps) and all other outputs terminated into a minimum of 600 Ω.

CIRCUIT DESCRIPTION

Refer to the 8552R schematic drawing D10-066601-00 while reading this description.

Input Amplifier

A signal is applied to the input pins J1-7, J1-5, and J1-3, corresponding to the silk screen on the rear cover as +, -, and G, respectively. The signal is applied to a differential amplifier composed of U200 and U201. The inverting input sees a virtual ground at pin 2 of U200, therefore the current is attenuated and converted to a voltage at pin 6. The positive input signal is also treated as a current signal by the presence of negative feedback from U201. Both input signals now see a constant input impedance which offers an actively balanced input stage. The nature of the feedback presents a truely floating input stage. The common mode rejection is adjusted through two trims.

Potentiometer R204 adjusts low-frequency (DC-1KHz) common mode, while trim capacitor C203 nulls high-frequency (1KHz-20KHz) common mode.

VCA (voltage controlled attenuator)

General

Integrated circuit U302 is an audio multiplier. The gain is controlled by multiplying the input signal by the voltage present at the multiplier control port, U302 pin 8.

Description

A balanced signal from the input stage is AC coupled through C308/R210,R334 and C310/R211,R337 The signal is inverted through U305A/B and fed into the MAX GAIN switch (S301). As the name implies, this switch establishes the maximum gain available in the circuit. This function can only be controlled locally. The gain control, local or remote, has the effect of attenuating from the maximum gain by 40dB. Switch S301 selects different resistor values which change the signal gain through the audio multiplier. Integrated circuits U304A/B set the bias and drive signal currents into the audio multiplier The bias voltage is established with resistors R333,R338, and decoupled with capacitor C309. A balanced signal from multiplier pins 10 and 13, is converted to an unbalanced signal through U300A. Integrated circuit U300B maintains very low DC offset by integrating the output signal, from U300A, over a very long time constant and feeding a correction voltage back into U300A through R302.

Control Port

General

The control port circuitry generates the necessary voltages for local and remote gain control. A summing node is available as an input, which allows for multiple remote control potentiometers. The input signal is filtered and level adjusted, then fed into the control port of the audio multiplier. The port is set up such that when the remote input line is disconnected, or zero volts is applied, the DA will default to unity gain.

Description

Integrated circuit U303A/B generates the control voltages used for local and remote gain operation. The control potentiometer swings between the two reference voltages with the wiper voltage fed into the control circuitry. The input port is a low impedance node, therefore a series resistor with the wiper is required which converts the wiper voltage into a current. Because of the low input impedance, several control pots may be paralleled and fed into the same port, or two DA's may be controlled from the same potentiometer. Note: this function is useful for stereo applications. The LOCAL GAIN control (R323) operates into the same node. The MODE switch (S300) selects gain control from both sources. Integrated circuit U301 filters the incoming currents and sets up the control voltage. The PORT GAIN trim potentiometer (R309) is used to calibrate the control voltage gain. This adjustment is used to match the gain of different DA's when the same control voltage is applied. The control voltage of U301 is further attenuated and filtered through R303, R315, and C306. The 0dB CAL trim potentiometer (R318) provides a DC offset into this node which calibrates the unity gain point when zero volts is applied to the control input. Transistor Q300

temperature compensates the control port of the audio multiplier, so that the gain of the amplifier stays relatively constant over temperature variations.

Output Stage

General

The output stage provides the balanced output. Two almost identical stages, one inverting, one noninverting, drive the output loads. The stages are alike enough that only the noninverting stage will be described.

Description

The noninverting stage can be identified by the circuitry surrounding U101. The signal is fed into the Op-amp which supplies the voltage amplification. Transistors Q105, Q106, Q107 and Q108 supply the current amplification needed to drive the load. Output "bootstrapping" from R138/C118 and R137/C119 allow the Op-amp output voltage to swing above its supply voltages. A Vbe multiplier comprised of Q109, R143, R144 and BIAS adjust R145 supply the bias voltage necessary to reduce crossover distortions. Feedback to the Op-amp is taken through resistor R131. The output transistors operate from the pre-regulated ±16V supplies. They are separately filtered and fused from the rest of the DA circuitry. As an added convenience in troubleshooting, zero ohm jumpers (R106 and R107) are available to isolate the load from the DA; and front panel test points are available to monitor the signal. Note: the test points are designed to be monitored by high impedance probes. It will not give accurate readings when terminated with a low impedance (600 Ω or 150 Ω).

Voltage Regulator

The voltage regulator is a low headroom, dual polarity, hybrid regulator. The incoming ±16V DC preregulated supply voltage is regulated down to approximately ±14.7V which then supplies most of the DA circuitry. The hybrid provides foldback current protection in the event of abnormal load conditions. Zero ohm resistor links (R3 and R4) allow the regulator to be isolated from the rest of the DA circuitry during trouble shooting.

ADJUSTMENTS

NOTE

This equipment is fully adjusted at the factory.Only front panel controls need to be adjusted to suit your specific system requirements. Internal adjustments are normally not required unless repairs have been made. If the module does not operate, make sure that it is properly installed and power is applied. Then consult the trouble shooting section to assist in locating defec-

tive components. Only attempt adjustments if you have the following equipment.

Test Equipment Required

Digital Voltmeter (DVM)	Fluke 8000 Series or equivalent
Balanced Signal Generator	Tektronix SG 505 or equivalent

Adjustment Procedure

Refer to the 8552R component location drawing (B07-066601-00) while performing adjustments.

Preliminary Set-Up

1. Place MODE switch (S300) to the LOCal position.
2. Place MAX GAIN switch (S301) to the +10dB position.
3. Install module into equipment tray.
4. Allow equipment to warm-up for 15 minutes

Voltage Regulator Check

1. Monitor the +14.7V DC test point (front of module). Check for +14.7V (+250mV/-100mV)
2. Repeat for -14.7V DC test point.

Bias Current

1. With no input signal applied, connect the positive lead of a DVM to the emitter of Q107, negative lead to the emitter of Q106.
2. Set the Bias Adjust (R145) for a reading of 47mV DC ±5mV.
3. Repeat step 1, positive lead to the emitter of Q102, negative lead to emitter of Q104.
4. Set the Bias Adjust (R114) for a reading of 47mV DC ±5mV.

Common Mode

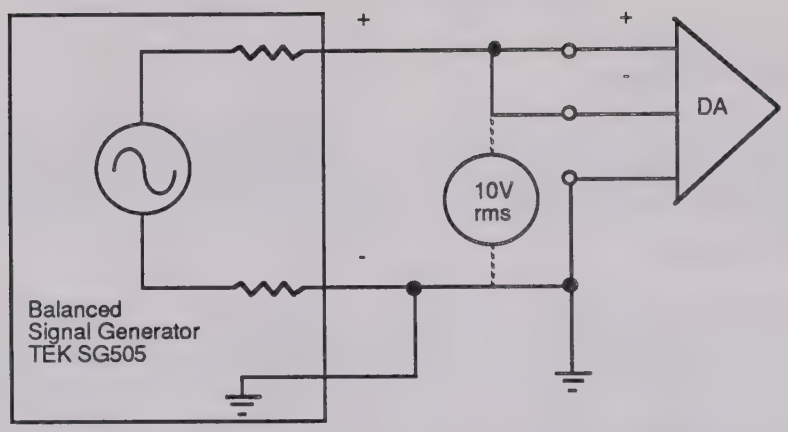


Figure 1. Common Mode Set-up

1. Set the MAX GAIN switch (S301) to the +30dB position. Set MODE switch (S300) to the LOCal position. Adjust LOCAL GAIN (R323) for +30dB gain.

2. Set the signal generator's oscillator to 60Hz. Supply the same signal to both inputs (common mode input) in fig.1.

3. Adjust the oscillator level to read 10.0V (rms) at the DA input.

4. Low frequency adjustment: Monitor the DA output with a DVM (AC scale). Adjust R204 for less than 3.16mV AC.

5. High frequency adjustment: Set generator to 5KHz. Re-check level for 10.0V (rms). Adjust C203 for less than 3.16mV AC.

6. Repeat steps 2 through 5 if necessary.

OdB Calibration

1. Set MODE switch (S300) to the REMote position.

2. Set MAX GAIN switch (S301) to the +10dB position.

3. Disconnect remote input line from DA, and short input port to ground through a 100kΩ (0.1%) resistor.

4. Adjust 0dB CAL (R318) for unity gain as measured at the output test points on the front of the module.

Port Gain

1. Insure that the amplifier is set to unity gain (0dB Calibration procedure above).
2. Set MODE switch (S300) to the REMote position.
3. Connect a 10KΩ potentiometer (with a 100KΩ, 0.1% resistor in series with the wiper) to the remote input. (See the Remote Gain Range Table and Diagram's, Figure 3.)
4. Set the remote control potentiometer so that -0.8408V DC is applied to the wiper of the 10KΩ remote potentiometer.
5. Supply a 1.00V rms signal to the input.
6. Adjust PORT GAIN (R309) so that 1.4125V (rms) is measured at the output test points on the front of the module.

This completes the adjustment procedure

TROUBLESHOOTING GUIDE

Power Supply

1. Check for +16V DC at pin 13 and for -16V DC at pin 11 of connector J1. If either is incorrect, check frame power supply. Module connecter J1 is numbered 1 to 49 (odd numbers) across front edge and 2 to 50 (even numbers) across rear edge.
2. Check for +16V DC at pin 5 and for -16V DC at pin 13 of hybrid U1. If voltage is not present, then suspect the input filter circuit.
3. Check for ±14.7V DC at test points on front of module. If voltage is incorrect, it may be due to excessive loading causing the regulator to go into foldback. The load of the module may be isolated from the regulator by cutting supply traces at R3 and R4. Measure the voltage at the test points. If the voltage remains low, the regulator is defective. If the voltage is correct, there is an excessive current loading in the audio circuitry.

Audio

1. Be sure the power supply is working correctly prior to troubleshooting other module circuitry.
2. If possible, substitute a known working module to isolate the problem to the module or the frame and external wiring. If the problem is on the module, a quick check with a scope on the output pins of op-amps U100, U101, U200, U201, U300A and U305A/B will verify these integrated circuits are operational. Also check the output test points on the front of the module.

3. For proper operation, the input must be connected in a differential mode as opposed to a common mode.

4. The two output amplifiers are powered by the ±16V DC (pre-regulated) supply and are individually filtered and fused. Failure of one of the output amplifiers will cause the DA output to decrease by 6dB.

5. Review the schematic carefully. Many voltages and gain levels are recorded for user convenience.

REMOTE CONTROL PORT CONNECTIONS

General

Remote gain and/or balance control of the 8552R audio DA is accomplished through a remote control potentiometer. In the simplist configuration, the user must supply the following components; the interconnecting cable, the control potentiometer(s), and fixed value resistors. Other configurations, such as gain control with one potentiometer over two DA's; or reduced control range, require additional components explained below.

Note on Shielded Cables

In all of the installation descriptions, shielded cables must be used in order to reduce RF interference and hum pick-up. 100% shielding or Belfoil type shielding is highly recommended. Good grounding practices must also be followed in order to minimumize RF interference.

Rear Connector Interface

The DA supplies the necessary voltages for remote gain operation. The voltages supplied are; +7V DC (used for attenuation) and -4V DC (used for gain). There is also an input pin which accepts the control current which is processed into the actual multiplier control voltage. These pins are available at the rear tray connectors. The rear connector may be labeled INPUTS or INPUT and AUX depending on when the silk screen for the tray was manufactured. See figure 2 for pin identification.

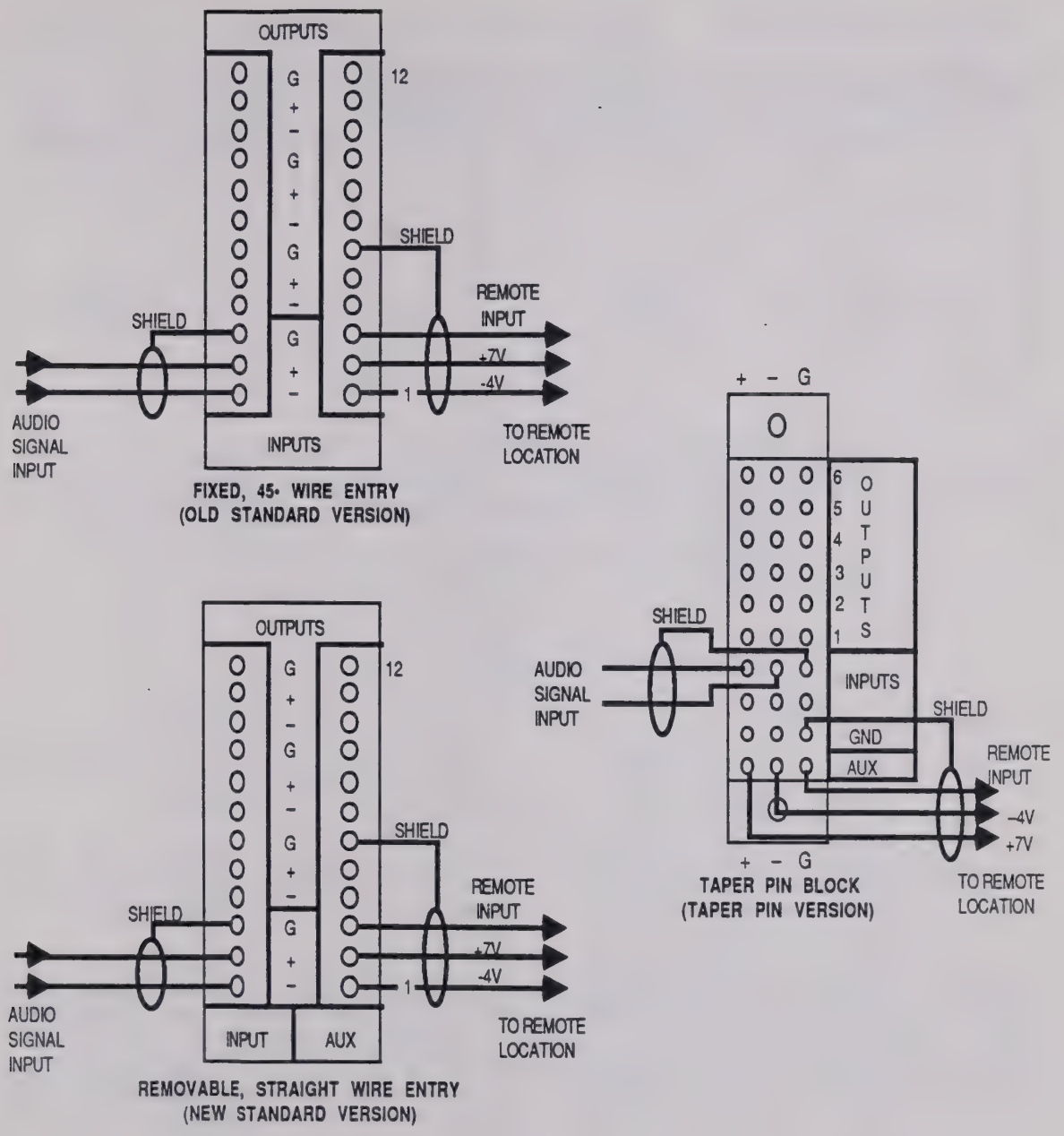
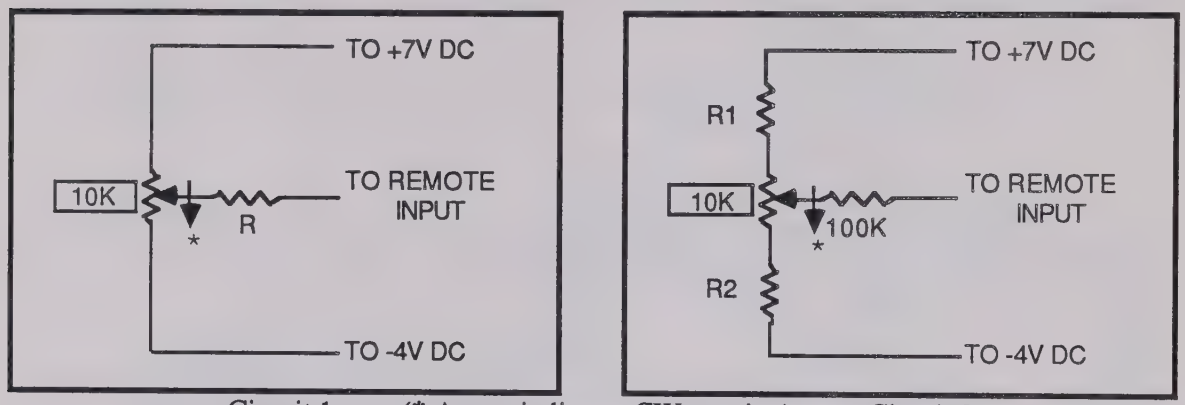


Figure 2. Rear Connector Interface

REMOTE GAIN RANGE

The remote control gain range may be modified to fit custom requirements. The two circuit diagram's and corresponding range table's below outline some of the possibilities.



Circuit 1 (* Arrow indicates CW rotation) Circuit 2

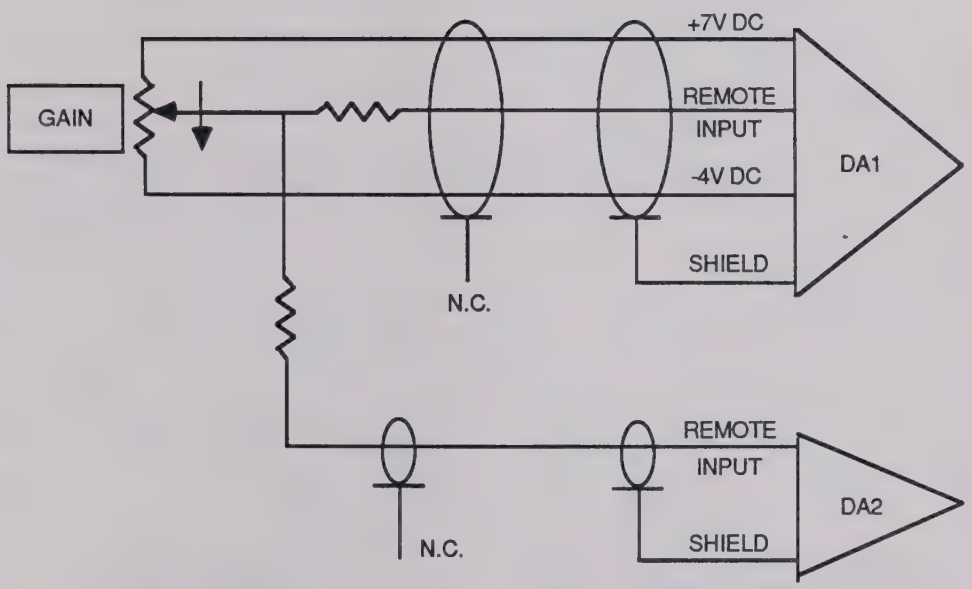
Figure 3. Remote Gain Range Circuit Diagram's

REMOTE GAIN RANGE TABLE

Circuit 1			Circuit 2			
R	MAX GAIN	GAIN RANGE	GAIN RANGE	MAX GAIN	R1	R2
100K	+10 dB	-30 dB to + 10 dB	+10 dB to -10 dB	+10 dB	0K	8.2K
	+20 dB	-20 dB to + 20 dB		+20 dB	6.2K	4.7K
	+30 dB	-10 dB to + 30 dB		+30 dB	8.2K	0K
180K	+10 dB	-16 dB to + 6 dB	+6 dB to - 6 dB	+10 dB	3.9K	16K
	+20 dB	-6 dB to + 16 dB		+20 dB	13K	10K
	+30 dB	+4 dB to + 26 dB		+30 dB	16K	3.9K
240K	+10 dB	-12 dB to + 4 dB	-3 dB to + 3 dB	+10 dB	13K	36K
	+20 dB	- 2 dB to + 14 dB		+20 dB	36K	24K
	+30 dB	+ 8 dB to + 24 dB		+30 dB	13K	36K
510K	+10 dB	-5 dB to + 2 dB	-1 dB to + 1 dB	+10 dB	43K	100K
	+20 dB	+5 dB to + 12 dB		+20 dB	110K	91K
	+30 dB	+15 dB to + 22 dB		+30 dB	100K	43K
750K	+10 dB	-3 dB to + 1 dB				
	+20 dB	+6 dB to + 11 dB				
	+30 dB	+16 dB to + 21 dB				

Connecting Two DA's to the Same Control Potentiometer

Two distribution amplifiers may be controlled by the same potentiometer. This feature is useful in stereo applications where the gain tracking of two channels needs to be precisely controlled. The procedure is very similar to controlling one DA. See figure 4 below for proper connection.



Important: To insure good gain tracking between the two DA's, precision series resistors must be used. Tolerance mismatch will show up as gain errors. We recommend that the series resistor tolerance be equal to or less than 0.1%. The absolute value of the series resistors is not as critical as the matching tolerance.

Figure 4. Wiring diagram: 2 Audio DA's to 1 Potentiometer

Adding a Balance Control

A balance control may be added to a pair of DA's which will affect the gain of only one DA. The gain range balance may be tailored to your specific needs (either the full gain range or just a trim).

Determine the gain range balance required. From the Remote Gain Range Table and figure 3, select the appropriate circuit (1 or 2) and component values. Connect the poteniometer circuit up to the proper control voltages and connect the series resistor to the control input wire of the DA you wish to control. See figure 5 below for wiring details.

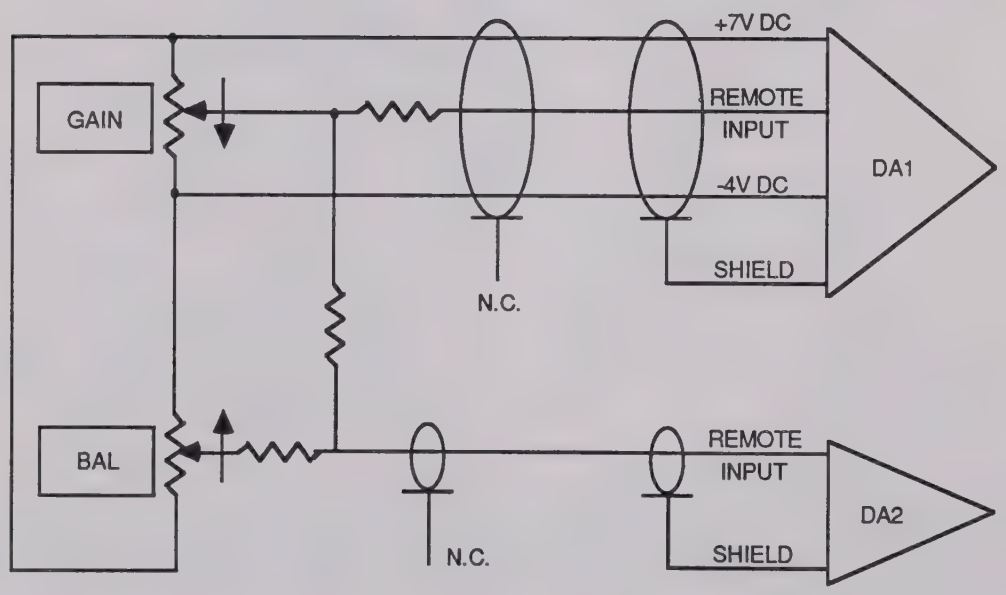


Figure 5. Wiring Diagram: Adding a balance control to a pair of Audio DA's

NOTE

DA 1 has gain control only. DA 2 has both gain and balance control.

R E P L A C E M E N T P A R T S L I S T

8552R REMOTE GAIN AUDIO DA
ASSEMBLY NUMBER: 066601-00 ISSUE: H ECN: J581

ITM NO	REFERENCE DESIGNATOR	GVG PART NUMBER	DESCRIPTION MFG CODE/PART NUMBER	QTY
020	[C101,C102,C104, C105,C106,C107, C116,C117, C303,C304,C305, C307]	CB0132-00	CAP,CER .1UF 20% 50WV Z5U AXIAL GVG/A70-CB0132-00 A1	12
030	[C200]	CB0139-00	CAP,CER 10PF 5% 200WV COG GVG/A70-CB0139-00 A3	1
035	[C1,C2,C112,C113, C308,C310]	CB1094-00	CAP,ALUM 100UF 20% 25WV GVG/A70-CB1094-00 A1	6
040	[C111,C114]	CB2113-00	CAP,MICA D7 22PF 5% 500WV COD/CDS10ED220J03	2
045	[C110,C115]	CB2216-00	CAP,MICA D10 39PF 5% 500WV COD/CD10ED390J03	2
050	[C3,C4,C100,C103, C108,C109,C118, C119,C201,C204, C301,C302,C306, C309]	CB4029-00	CAP,TANT 10UF 10% 20WV GVG/A70-CB4029-00 A1	14
055	[C203]	CB5021-00	CAP,VAR 2.7-10PF 100WV TOP SEALED GVG/A70-CB5021-00 A1	1
080	[U1]	HB9048-00	HYBRID,+/-10V SIP REG GVG/HB9048-00	1
100	[R323]	PD0080-00	POT,10K 10% LIN .5X.25 CLA/392X10K "S" TAPER 0.25 LONG	1
105	[R309]	PD2013-00	POT,TRIM CERMET 10K 10% TOP BOR/3329H-1-103	1
110	[R114,R145,R318]	PD2027-00	POT,TRIM CERMET 2K 10% TOP BOR/3329H-1-202	3
112	[R204]	PD2028-00	POT,TRIM CERMET 20K 10% TOP BOR/3329H-1-203	1
115	[R310,R322,R324]	RB2104-00	RES,100K OHM 2% 1/4W MTL FLM COR/C07 100K 2%	3
120	[R301]	RB2105-00	RES,1 MEG OHM 2% 1/4W MTL FLM COR/C07 1M 2%	1
125	[R125,R136]	RB2470-00	RES,47 OHM 2% 1/4W MTL FLM COR/C07 47R 2%	2
130	[R117,R118,R121, R122,R132,R133, R139,R140]	RB2479-00	RES,4.7 OHM 2% 1/4W MTL FLM GVG/A70-RB2479-00 A1	8
135	[RN100]	HB9071-00	HYBRID,RES NET HI-POWER 25 OHM GVG/HB9071-00	1
140	[R119,R134,R207, R208,R305,R306, R307,R308]	RV1001-00	RES,1K OHM 1% 1/8W MTL FLM COR/CT4 1.0K 1%	8
145	[R123,R124,R137, R138,R316,	RV1002-00	RES,10K OHM 1% 1/8W MTL FLM COR/CT4 10K 1%	6

R E P L A C E M E N T P A R T S L I S T

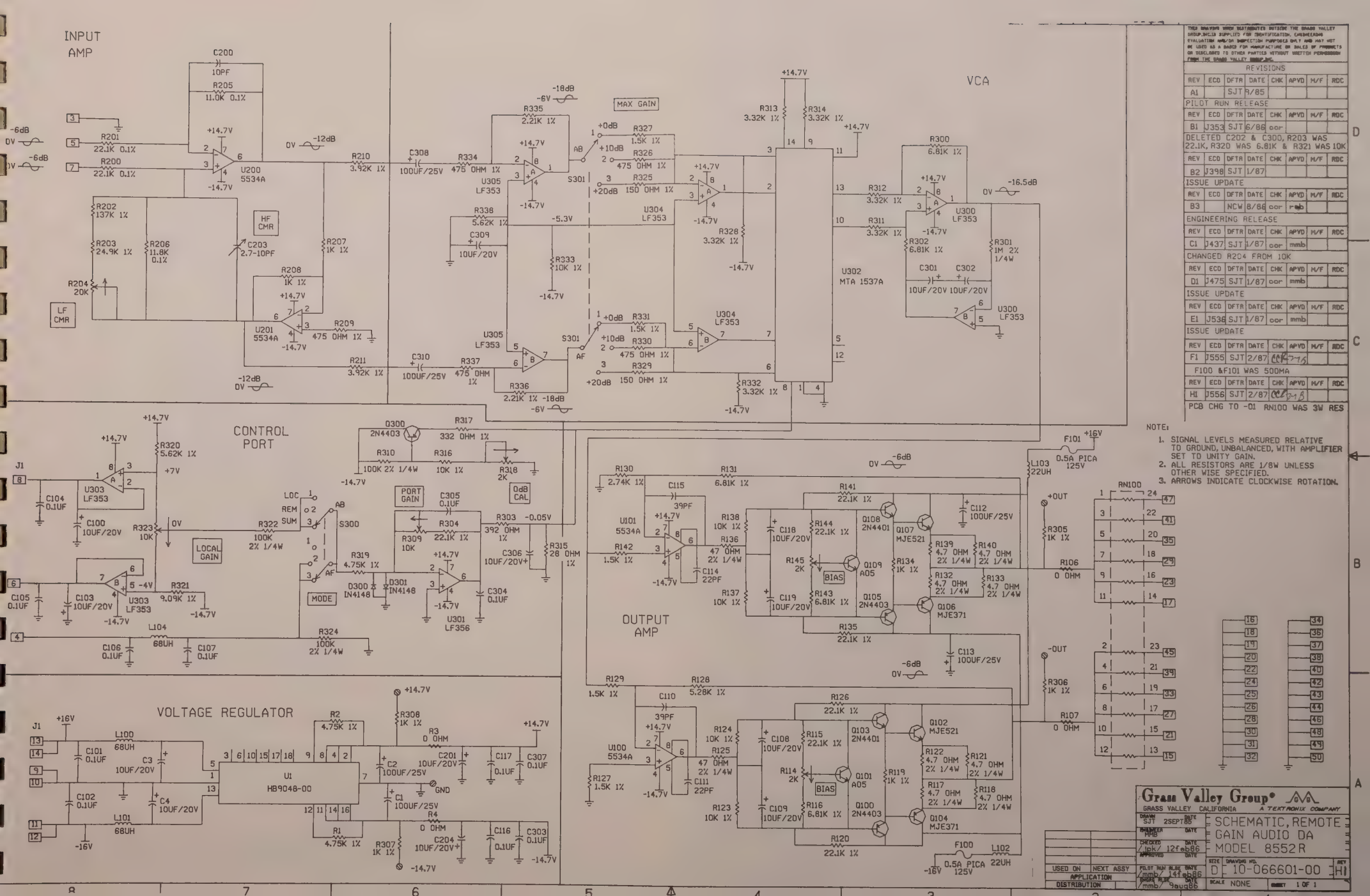
8552R REMOTE GAIN AUDIO DA
ASSEMBLY NUMBER: 066601-00 ISSUE: H ECN: J581

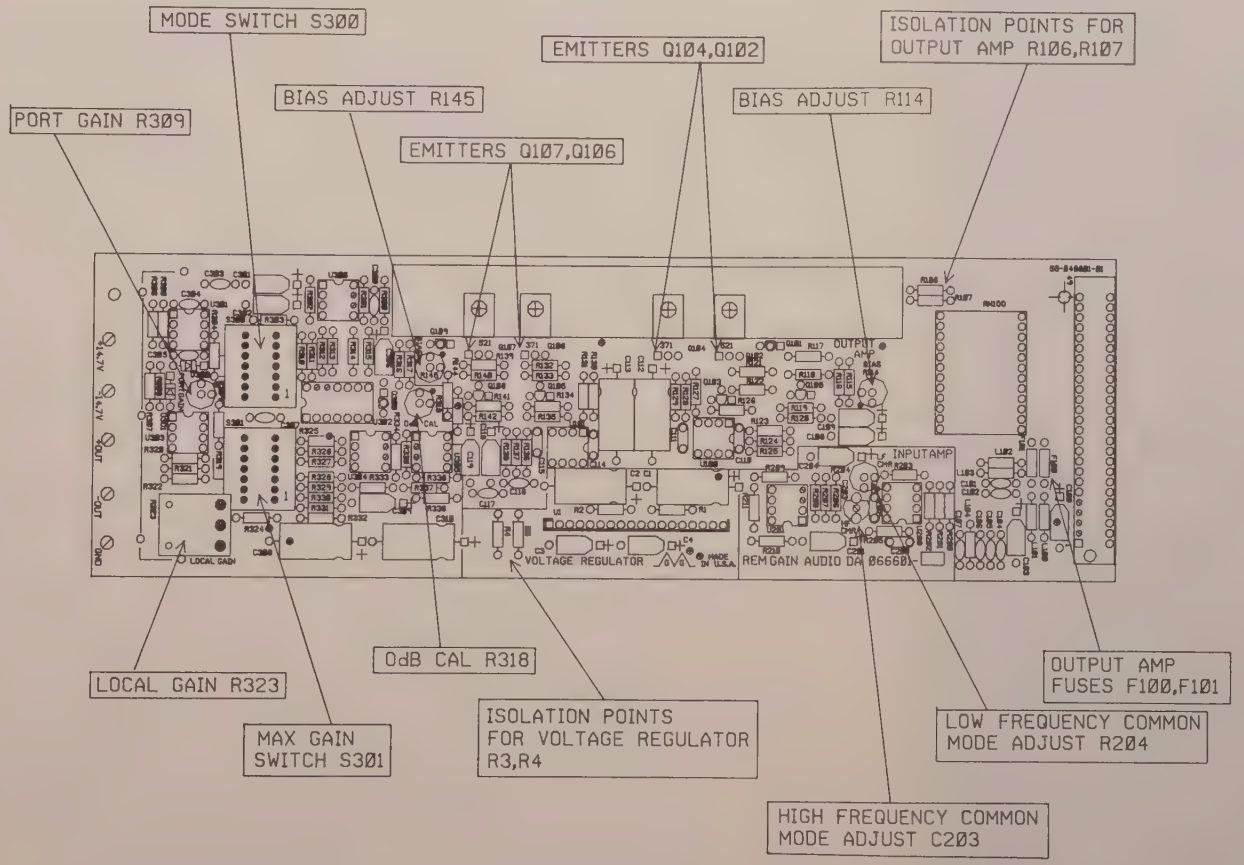
ITM NO	REFERENCE DESIGNATOR	GVG PART NUMBER	DESCRIPTION MFG CODE/PART NUMBER	QTY
145	R333]	RV1002-00	CONTINUED FROM PREVIOUS PAGE COR/CT4 10K 1%	
150	[R205]	RV1102-03	RES,1/10W 0.1% 11.0KOHM COR/RN55E1102B	1
151	[R206]	RV1182-03	RES,1/10W 0.1% 11.8KOHM COR/RN55E1182B	1
153	[R200,R201]	RV2212-03	RES,22.1K OHM .1% 1/8W MTL FLM COR/RN55E2212B	2
165	[R202]	RV1373-00	RES,137K OHM 1% 1/8W MTL FLM COR/CT4 137K 1%	1
170	[R325,R329]	RV1500-00	RES,150 OHM 1% 1/8W MTL FLM COR/CT4 150R 1%	2
175	[R127,R129,R142, R327,R331]	RV1501-00	RES,1.5K OHM 1% 1/8W MTL FLM COR/CT4 1.50K 1%	5
180	[R335,R336]	RV2211-00	RES,2.21K OHM 1% 1/8W MTL FLM COR/CT4 2.21K 1%	2
185	[R115,R120,R126, R135,R141,R144, R304]	RV2212-00	RES,22.1K OHM 1% 1/8W MTL FLM COR/CT4 22.1K 1%	7
192	[R203]	RV2492-00	RES,24.9K OHM 1% 1/8W MTL FLM COR/CT4 24.9K 1%	1
195	[R130]	RV2741-00	RES,2.74K OHM 1% 1/8W MTL FLM COR/CT4 2.74K 1%	1
200	[R315]	RV2809-00	RES,28 OHM 1% 1/8W MTL FLM COR/C4 28R 1%	1
205	[R317]	RV3320-00	RES,332 OHM 1% 1/8W MTL FLM COR/CT4 332R 1%	1
210	[R311,R312,R313, R314,R328,R332]	RV3321-00	RES,3.32K OHM 1% 1/8W MTL FLM COR/CT4 3.32K 1%	6
215	[R303]	RV3920-00	RES,392 OHM 1% 1/8W MTL FLM COR/CT4 392R 1%	1
220	[R210,R211]	RV3921-00	RES,3.92K OHM 1% 1/8W MTL FLM COR/CT4 3.92K 1%	2
225	[R209,R326,R330, R334,R337]	RV4750-00	RES,475 OHM 1% 1/8W MTL FLM COR/CT4 475R 1%	5
230	[R1,R2,R319]	RV4751-00	RES,4.75K OHM 1% 1/8W MTL FLM COR/CT4 4.75K 1%	3
235	[R128]	RV5281-00	RES,5.28K OHM 1% 1/8W MTL FLM COR/CT4 5.28K 1%	1
240	[R320,R338]	RV5621-00	RES,5.62K OHM 1% 1/8W MTL FLM COR/CT4 5.62K 1%	2
245	[R116,R131,R143, R300,R302]	RV6811-00	RES,6.81K OHM 1% 1/8W MTL FLM COR/CT4 6.81K 1%	5
247	[R321]	RV9091-00	RES,9.09K OHM 1% 1/8W MTL FLM COR/CT4 9.09K 1%	1
255	[D300,D301]	SB3001-00	DIODE,SIG FDH9320 100MA DO-35 FAI/FDH9320	2
260	[Q104,Q106]	SB7006-00	TRANS,PNP MJE371 PWR 77-03 GVG/A70-SB7006-00 A1	2

R E P L A C E M E N T P A R T S L I S T

8552R REMOTE GAIN AUDIO DA
ASSEMBLY NUMBER: 066601-00 ISSUE: H ECN: J581

ITM NO	REFERENCE DESIGNATOR	GVG PART NUMBER	DESCRIPTION MFG CODE/PART NUMBER	QTY
265	[Q102,Q107]	SB7007-00	TRANS,NPN MJE521 PWR 77-03 GVG/A70-SB7007-00 A1	2
270	[Q103,Q108]	SB8006-00	TRANS,NPN 2N4401 SM SIG TO-92 FAI/2N4401	2
275	[Q100,Q105]	SB8007-00	TRANS,PNP 2N4403 SM SIG TO-92 FAI/2N4403	2
280	[Q101,Q109]	SB8014-00	TRANS,NPN MPS-A05 SM SIG TO-92 CSC/MPS-A05	2
285	[U301]	SC0287-00	IC,LIN LF356N 8 DIP GVG/A70-SC0287-00 A1	1
290	[U100,U101,U200, U201]	SC0345-00	IC,LIN NE5534AN 8 DIP GVG/A70-SC0345-00 A2	4
295	[U300,U303,U304, U305]	SC0628-00	IC,LIN LF353N 8 DIP ANG/AD642JH	4
300	[U302,Q300]	076327-00	8500,AUDIO VOLTAGE CONTROL AMP	1
305	[S300,S301]	SJ0127-00	SWITCH,2 POLE 3 POSN PCB 1 MODULE GVG/A70-SJ0127-00 A3	2
320	[L102,L103]	ZB4029-00	INDCTR,MINI 22UH 10% DAL/IM2-12-22UH-10%	2
325	[L100,L101,L104]	ZB4035-00	INDCTR,MINI 68UH 10% DAL/IM2-12-68UH-10%	3
331	[F100,F101]	FB4002-01	FUSE,PICO 1/2 AMP 100% 4HRS 125V LFI/251.500	2


INPUT AMP
VCA
CONTROL PORT
VOLTAGE REGULATOR
OUTPUT AMP
MAX GAIN
HF CMR
LF CMR
LOCAL GAIN
PORT GAIN
0dB CAL
BIAS
MODE
REVISIONS
REV ECO DFTR DATE CHK APVD M/F RDC
A1 SJT 9/85
PILOT RUN RELEASE
B1 J353 SJT 6/86 cor
DELETED C202 & C300, R203 WAS 22.1K, R320 WAS 6.81K & R321 WAS 10K
B2 J398 SJT 1/87
ISSUE UPDATE
B3 NCW 8/86 cor mmb
ENGINEERING RELEASE
C1 J437 SJT 1/87 cor mmb
CHANGED R204 FROM 10K
D1 J475 SJT 1/87 cor mmb
ISSUE UPDATE
E1 J536 SJT 1/87 cor mmb
ISSUE UPDATE
F1 J555 SJT 2/87
F100 &F101 WAS 500MA
H1 J556 SJT 2/87
PCB CHG TO -01 RN100 WAS 3W RES
NOTE:
1. SIGNAL LEVELS MEASURED RELATIVE TO GROUND, UNBALANCED, WITH AMPLIFIER SET TO UNITY GAIN.
2. ALL RESISTORS ARE 1/8W UNLESS OTHER WISE SPECIFIED.
3. ARROWS INDICATE CLOCKWISE ROTATION.
Grass Valley Group
GRASS VALLEY CALIFORNIA A TEKTRONIX COMPANY
SCHEMATIC, REMOTE GAIN AUDIO DA MODEL 8552R
10-066601-00 H1
SCALE NONE SHEET 1 OF 1



REVISIONS					
REV	ECO	DFTR	DATE	CHK	APVD
A1		SJT	1/86	ccr	
PILOT RUN RELEASE					
REV	ECO	DFTR	DATE	CHK	APVD
B1	J353	SJT	6/86	ccr	mmb
ISSUE UPDATE					
REV	ECO	DFTR	DATE	CHK	APVD
B3		NCW	8/86	ccr	rab
ENGINEERING RELEASE					
REV	ECO	DFTR	DATE	CHK	APVD
C1	J437	SJT	1/87	ccr	mmb
ISSUE UPDATE					
REV	ECO	DFTR	DATE	CHK	APVD
D1	J475	SJT	1/87	ccr	mmb
ISSUE UPDATE					
REV	ECO	DFTR	DATE	CHK	APVD
E1	J536	SJT	1/87	ccr	mmb
ISSUE UPDATE					
REV	ECO	DFTR	DATE	CHK	APVD
F1	J555	SJT	2/87	ccr	mmb
ISSUE UPDATE					
REV	ECO	DFTR	DATE	CHK	APVD
H1	J556	SJT	2/87	ccr	mmb
PCB CHANGED TO -01					
REV	ECO	DFTR	DATE	CHK	APVD

USED ON

DRAWN DATE	SJT 29JAN86
ENGINEER DATE	MMB
CHECKED DATE	/jpk/ 13feb86
PILOT RUN RLSE DATE	/mmb/ 14feb86
ENGRG RLSE DATE	/mmb/7aug86

COMPONENT LOCATION
REM GAIN AUDIO DA
MODEL 8552R

SIZE	DRAWING NO.	REV
B	07-066601-00	H1

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GRASS VALLEY GROUP
GRASS VALLEY CALIFORNIA
A TEKTRONIX COMPANY

INTRODUCTION

The 8553 Audio Tone Generator is designed for use as a house reference signal . The unit may be configured in different modes to suit the needs of a modern plant. In its basic configuration, the module will supply a continuous tone (either 440Hz or 1KHz) to six outputs. The output stage is capable of operating in a voltage mode, or either 150 ohm or 600 ohm termination mode. The output level is continuously adjustable over the range specified via the front panel level control and an internal jumper. The 8553 has a unique output level mode which cycles between two levels (Peak and Average). This mode is useful when both VU and PPM meters are used to monitor the same reference signal. The Peak/Average mode produces a Peak level burst for 40mS, followed by an Average level one for 400mS. This pattern repeats itself in this mode. The PPM meters should be set to the peak level, while the VU type meters should be set to the Average level. A front panel vernier control is used to adjust the Peak level. The Average level is attenuated (from the peak) by an internal adjustment.

SPECIFICATIONS

Performance

Output Frequency (Jumper selectable)	440Hz/1KHz
THD+N 80KHz low pass +18dBm	< 0.02%
Tone Burst Output	
Peak level duration	40mS, fixed
Ave. level duration	400mS, fixed
Peak to Ave. ratio	adjustable from -8dB to -12dB

Output

Quantity & Type	Six Active Balanced
Normal Level (jumper selectable in three ranges)	-4dBu to +4dBu +3dBu to +11dBu +10dBu to +18dBu
Level Continuously Adjustable	
Voltage Mode	-4dBm to +18dBm
Into 600Ω	-4dBm to +18dBm
Into 150Ω	0dBm to +21dBm
Output to Output Isolation 20Hz to 20KHz	>60dB

SPECIFICATIONS (cont.)

DC offset	<10mV
Impedance	50 Ω, ±5%
Gain match between outputs	
Into 600 ohms	±0.05dB
Into 150 ohms	±0.10dB

Note: In a 1RU frame, all specifications will be met with one shorted output and all other outputs terminated into a minimum of 600 Ω.

In a 2RU frame, all specifications will be met with three shorted outputs (on separate amps) and all other outputs terminated into a minimum of 600 Ω.

FUNCTIONAL/CIRCUIT DESCRIPTION

Refer to the 8553 schematic drawing D10-066631-00 while reading this description.

Oscillator

This circuit generates a continuous (frequency and amplitude) tone. Jumper S302 and S303 selects the output frequency between 1KHz and 440Hz.

A Wein bridge oscillator is composed of IC (U303) and associated components. A peak detector (D301 and Q302) control the gain of the oscillator by adjusting the gate voltage of FET Q304. The oscillator amplitude is adjusted by potentiometer R327. This level remains constant in all modes.

Gain Stage

The gain stage adjust the oscillator level. Front control R318 adjusts the oscillator level at U302-3. This provides fine adjustment over an eight dB range. Jumper S301 selects the coarse range.

Peak/Ave Amp

The Peak/Ave tone is controlled by U300 and FET Q300. During continuous operation, peak level set, Q300 is ON. This produces the maximum gian in U300. During the Ave level set mode, Q300 is OFF which causes U300 to attenuate. The level of attenuation is adjusted by R302, Ave Level Attenuation. The signal from U300-1 is fed to the output stage.

Multivibrator

The multivibrator circuit controls the Peak or Ave level of U300. The circuit is composed of a free running oscillator U301. The mode is controlled by jumper S300. In the Peak level set (continuous) mode, the output (Q301-C) is forced high to 0V. This turns Q300 ON. During the

Ave level mode, output Q301-C is forced low to -14V. This turns Q300 OFF. During the Peak/Ave mode, Q301-C oscillates between zero and -14V with a 10% duty cycle; -14V for 400mS, 0V for 40mS. This turns Q300 on and off thus changing the tone level.

Output Stage

General

The output stage provides the balanced output. Two almost identical stages, one inverting, one noninverting, drive the output loads. The stages are alike enough that only the noninverting stage will be described.

Description

The noninverting stage can be identified by the circuitry surrounding U101. The signal is fed into the Op-amp which supplies the voltage amplification. Transistors Q105, Q106, Q107 and Q108 supply the current amplification needed to drive the load. Output "bootstrapping" from R138/C118 and R137/C119 allow the Op-amp output voltage to swing above its supply voltages. A Vbe multiplier comprised of Q109, R143, R144 and BIAS adjust R145 supply the bias voltage necessary to reduce crossover distortions. Feedback to the Op-amp is taken through resistor R131. The output transistors operate from the pre-regulated ±16V supplies. They are separately filtered and fused from the rest of the DA circuitry. As an added convenience in troubleshooting, zero ohm jumpers (R106 and R107) are available to isolate the load from the DA; and front panel test points are available to monitor the signal. Note: the test points are designed to be monitored by high impedance probes. It will not give accurate readings when terminated with a low impedance (600 Ω or 150 Ω).

Voltage Regulator

The voltage regulator is a low headroom, dual polarity, hybrid regulator. The incoming ±16V DC preregulated supply voltage is regulated down to approximately ±14.7V which then supplies most of the DA circuitry. The hybrid provides foldback current protection in the event of abnormal load conditions. Zero ohm resistor links (R3 and R4) allow the regulator to be isolated from the rest of the DA circuitry during trouble shooting.

ADJUSTMENTS

NOTE

This equipment is fully adjusted at the factory.Only front panel controls need to be adjusted to suit your specific system requirements. Internal adjustments are normally not required unless repairs have been made. If the module does not operate, make sure that it is properly installed and power is applied.

Then consult the trouble shooting section to assist in locating defective components. Only attempt adjustments if you have the following equipment.

Test Equipment Required

Digital Voltmeter (DVM)	Fluke 8000 Series or equivalent

Adjustment Procedure

Refer to the 8552R component location drawing (B07-066601-00) while performing adjustments.

Preliminary Set-Up

1. Set frequency jumpers, S302 and S303, to 1KHz position.
2. Set Coarse level jumper, S301, to -4 to +4dBu position.
3. Set Mode jumper, S300, to Peak Level Set (continuous) position.

Voltage Regulator Check

1. Monitor the +14.7V DC test point (front of module). Check for +14.7V (+250mV/-100mV)

2. Repeat for -14.7V DC test point.

Bias Current

1. Connect the positive lead of a DVM to the emitter of Q107, negative lead to the emitter of Q106.

2. Set the Bias Adjust (R145) for a reading of 47mV DC ±5mV.

3. Repeat step 1, positive lead to the emitter of Q102, negative lead to emitter of Q104.

4. Set the Bias Adjust (R114) for a reading of 47mV DC ±5mV.

Oscillator Balance Adjustment

1. Set DVM to DC.

2. Connect DVM between ground and the gate of Q304.

3. Adjust R333 for -1.3V DC ±0.2V.

Oscillator Level Adjustment

1. Set DVM to AC response.
2. Connect meter between U303-6 and ground.
3. Adjust OSC LEVEL, R327, for 4.000V rms.

This completes the adjustment procedure

TROUBLESHOOTING GUIDE

Power Supply

1. Check for +16V DC at pin 13 and for -16V DC at pin 11 of connector J1. If either is incorrect, check frame power supply. Module connecter J1 is numbered 1 to 49 (odd numbers) across front edge and 2 to 50 (even numbers) across rear edge.

2. Check for +16V DC at pin 5 and for -16V DC at pin 13 of hybrid U1. If voltage is not present, then suspect the input filter circuit.

3. Check for ±14.7V DC at test points on front of module. If voltage is incorrect, it may be due to excessive loading causing the regulator to go into foldback. The load of the module may be isolated from the regulator by cutting supply traces at R3 and R4. Measure the voltage at the test points. If the voltage remains low, the regulator is defective. If the voltage is correct, there is an excessive current loading in the audio circuitry.

Audio

1. Be sure the power supply is working correctly prior to troubleshooting other module circuitry.

2. If possible, substitute a known working module to isolate the problem to the module or the frame and external wiring. If the problem is on the module, a quick check with a scope on the output pins of op-amps U100, U101, U302, U303, and U300A will verify these integrated circuits are operational. Also check the output test points on the front of the module.

3. The two output amplifiers are powered by the ±16V DC (pre-regulated) supply and are individually filtered and fused. Failure of one of the output amplifiers will cause the DA output to decrease by 6dB.

4. Review the schematic carefully. Many voltages and gain levels are recorded for user convenience.

R E P L A C E M E N T P A R T S L I S T

8553 AUDIO TONE GENERATOR
ASSEMBLY NUMBER: 066631-00 ISSUE: F ECN: J556

ITM NO	REFERENCE DESIGNATOR	GVG PART NUMBER	DESCRIPTION MFG CODE/PART NUMBER	QTY
001		046631-02	PCB,AUDIO TONE GENERATOR,8553	1
006	[J1]	CF1462-00	CONN,RCPT,50POS 2 ROW PCB MNT AMP/534204-1	1
010	[C307,C308]	CB3088-00	CAP,FILM .1UF 5% 100WV GVG/A70-CB3088-00 A1	2
011	[C101,C102,C116, C117,C302]	CB0132-00	CAP,CER .1UF 20% 50WV Z5U AXIAL GVG/A70-CB0132-00 A1	5
013	[C110,C111,C114]	CB2113-00	CAP,MICA D7 22PF 5% 500WV COD/CDS10ED220J03	3
014	[C115]	CB2119-00	CAP,MICA D7 39PF 5% 500WV COD/CDS10ED390J03	1
018	[C3,C4,C108,C109, C118,C119, C301,C303, C304,C305,C306]	CB4029-00	CAP,TANT 10UF 10% 20WV GVG/A70-CB4029-00 A1	11
019	[C1,C2,C112,C113]	CB1094-00	CAP,ALUM 100UF 20% 25WV GVG/A70-CB1094-00 A1	4
025	[R237,R333]	PD2012-00	POT,TRIM CERMET 1K 10% TOP BOR/3329H-1-102	2
026	[R114,R145,R302]	PD2027-00	POT,TRIM CERMET 2K 10% TOP BOR/3329H-1-202	3
027	[R322]	PD0073-00	POT,500 10% LIN .5X.25 CLA/CM45137	1
030	[R117,R118,R121, R122,R132,R133, R139,R140]	RB2479-00	RES,4.7 OHM 2% 1/4W MTL FLM GVG/A70-RB2479-00 A1	8
031	[R125,R136]	RB2470-00	RES,47 OHM 2% 1/4W MTL FLM COR/C07 47R 2%	2
034	[R308,R311,R313]	RB2273-00	RES,27K OHM 2% 1/4W MTL FLM COR/C07 27K 2%	3
035	[R314]	RB2105-00	RES,1 MEG OHM 2% 1/4W MTL FLM COR/C07 1M 2%	1
036	[RN100]	HB9071-00	HYBRID,RES NET HI-POWER 25 OHM GVG/HB9071-00	1
038	[R301]	RV1500-00	RES,150 OHM 1% 1/8W MTL FLM COR/CT4 150R 1%	1
039	[R303,R328]	RV2210-00	RES,221 OHM 1% 1/8W MTL FLM COR/CT4 221R 1%	2
040	[R335,R342]	RV3320-00	RES,332 OHM 1% 1/8W MTL FLM COR/CT4 332R 1%	2
041	[R334,R336,R339, R341]	RV3920-00	RES,392 OHM 1% 1/8W MTL FLM COR/CT4 392R 1%	4
042	[R318]	RV6810-00	RES,681 OHM 1% 1/8W MTL FLM COR/CT4 681R 1%	1
045	[R332]	RV7500-00	RES,750 OHM 1% 1/8W MTL FLM COR/CT4 750R 1%	1
046	[R119,R134,R300, R310,R315,R316,	RV1001-00	RES,1K OHM 1% 1/8W MTL FLM COR/CT4 1.0K 1%	8

R E P L A C E M E N T P A R T S L I S T

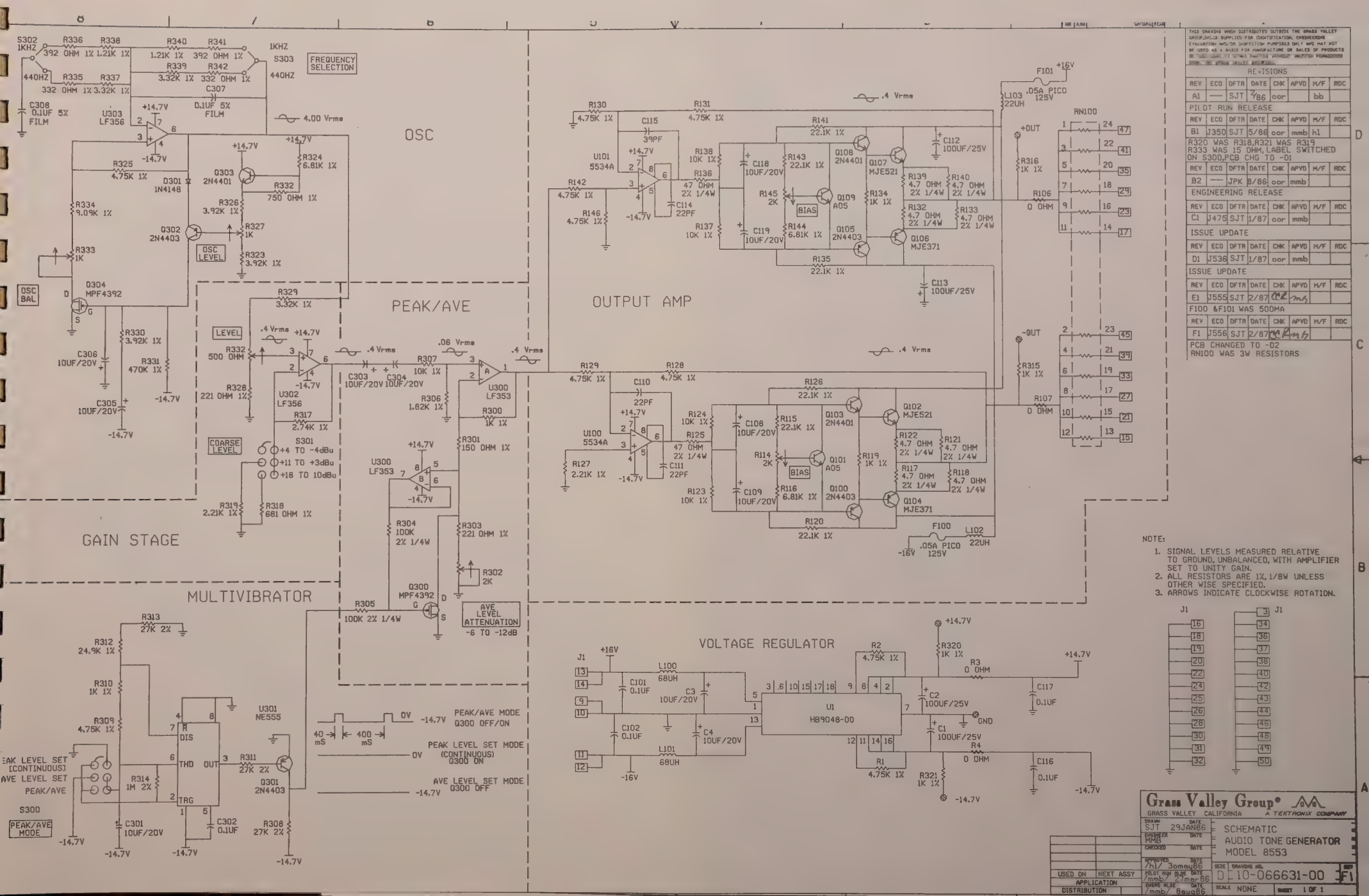
8553 AUDIO TONE GENERATOR
ASSEMBLY NUMBER: 066631-00 ISSUE: F ECN: J556

ITM NO	REFERENCE DESIGNATOR	GVG PART NUMBER	DESCRIPTION MFG CODE/PART NUMBER	QTY
046	R320,R321]	RV1001-00	CONTINUED FROM PREVIOUS PAGE COR/CT4 1.0K 1%	
047	[R338,R340]	RV1211-00	RES,1.21K OHM 1% 1/8W MTL FLM COR/CT4 1.21K 1%	2
049	[R127,R319]	RV2211-00	RES,2.21K OHM 1% 1/8W MTL FLM COR/CT4 2.21K 1%	2
050	[R306]	RV1821-00	RES,1.82K OHM 1% 1/8W MTL FLM COR/CT4 1.82K 1%	1
051	[R317]	RV2741-00	RES,2.74K OHM 1% 1/8W MTL FLM COR/CT4 2.74K 1%	1
052	[R329,R337,R339]	RV3321-00	RES,3.32K OHM 1% 1/8W MTL FLM COR/CT4 3.32K 1%	3
055	[R323,R326,R330]	RV3921-00	RES,3.92K OHM 1% 1/8W MTL FLM COR/CT4 3.92K 1%	3
056	[R1,R2,R128,R129, R130,R131,R142, R146,R309,R325]	RV4751-00	RES,4.75K OHM 1% 1/8W MTL FLM COR/CT4 4.75K 1%	10
057	[R116,R144,R324]	RV6811-00	RES,6.81K OHM 1% 1/8W MTL FLM COR/CT4 6.81K 1%	3
060	[R334]	RV9091-00	RES,9.09K OHM 1% 1/8W MTL FLM COR/CT4 9.09K 1%	1
061	[R123,R124,R137, R138,R307]	RV1002-00	RES,10K OHM 1% 1/8W MTL FLM COR/CT4 10K 1%	5
062	[R115,R120,R126, R135,R141,R143]	RV2212-00	RES,22.1K OHM 1% 1/8W MTL FLM COR/CT4 22.1K 1%	6
063	[R312]	RV2492-00	RES,24.9K OHM 1% 1/8W MTL FLM COR/CT4 24.9K 1%	1
064	[R304,R305]	RB2104-00	RES,100K OHM 2% 1/4W MTL FLM COR/C07 100K 2%	2
066	[R331]	RB2474-00	RES,470K OHM 2% 1/4W MTL FLM GVG/A70-RB2474-00 A1	1
069	[D301]	SB3001-00	DIODE,SIG FDH9320 100MA DO-35 FAI/FDH9320	1
070	[Q101,Q109]	SB8014-00	TRANS,NPN MPS-A05 SM SIG TO-92 CSC/MPS-A05	2
072	[Q300,Q304]	SB6008-00	TRANS,NJFET MPF4392 TO-92 GVG/A70-SB6008-00 A1	2
073	[Q100,Q105,Q301, Q302]	SB8007-00	TRANS,PNP 2N4403 SM SIG TO-92 FAI/2N4403	4
074	[Q103,Q108,Q303]	SB8006-00	TRANS,NPN 2N4401 SM SIG TO-92 FAI/2N4401	3
078	[U301]	SC0150-00	IC,LIN NE555N 8 DIP GVG/A70-SC0150-00 A1	1
079	[U100,U101]	SC0345-00	IC,LIN NE5534AN 8 DIP GVG/A70-SC0345-00 A2	2
080	[U300]	SC0628-00	IC,LIN LF353N 8 DIP ANG/AD642JH	1
081	[U303,U302]	SC0287-00	IC,LIN LF356N 8 DIP GVG/A70-SC0287-00 A1	2

R E P L A C E M E N T P A R T S L I S T

8553 AUDIO TONE GENERATOR
ASSEMBLY NUMBER: 066631-00 ISSUE: F ECN: J556

ITM NO	REFERENCE DESIGNATOR	GVG PART NUMBER	DESCRIPTION MFG CODE/PART NUMBER	QTY
085	[U1]	HB9048-00	HYBRID,+/-10V SIP REG GVG/HB9048-00	1
088	[F100,F101]	FB4002-01	FUSE,PICO 1/2 AMP 100% 4HRS 125V LFI/251.500	2
095	[S300,S301,S302, S303]	CF0676-03	CONN,PL HDR 3POS 1ROW PCB MNT DCS/65507-103	4
096	[1K HZ,1K HZ, +10 TO +18 DBU, PEAK LEVEL SET]	JA1009-00	JACK,SHTG BLK PLSTC 2 CNT AMP/530153-2	4
099		TA6059-00	TUR PN,.06X.1406 POST .0625 PCB GVG/A70-TA6059-00 A1	5
100		CC2048-00	CARD EJCTR,NYL WHT SNAP ON GVG/A70-CC2048-00 A1	1
110		WA2007-00	WSHR #4 SPLIT LOCK WASHER,#4,SPLIT RING,ZINC PL	4
115		033642-04	PANEL,LEGEND 8500	1
116		LA1025-00	LABEL,FRONT LEGEND 8553 DUR/C70-LA1025-00	1
118	[Q104,Q106]	SB7006-00	TRANS,PNP MJE371 PWR 77-03 GVG/A70-SB7006-00 A1	2
119	[Q102,Q107]	SB7007-00	TRANS,NPN MJE521 PWR 77-03 GVG/A70-SB7007-00 A1	2
122		006649-00	HEATSINK,TRANSISTOR,8500	1
124		HB2037-00	HEAT SINK,TO-126 INSUL W/THRM FLM BEQ/K4-60	4
130	[L100,L101]	ZB4035-00	INDCTR,MINI 68UH 10% DAL/IM2-12-68UH-10%	2
132	[L102,L103]	ZB4029-00	INDCTR,MINI 22UH 10% DAL/IM2-12-22UH-10%	2



REVISIONS							
REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
A1	—	SJT	3/86	oor		bb	
PILOT RUN RELEASE							
B1	J350	SJT	5/86	oor	mmb	hl	
R320 WAS R318,R321 WAS R319 R333 WAS 15 OHM,LABEL SWITCHED ON S300,PCB CHG TO -01							
REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
B2	—	JPK	8/86	oor	mmb		
ENGINEERING RELEASE							
REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
C1	J475	SJT	1/87	oor	mmb		
ISSUE UPDATE							
REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
D1	J536	SJT	1/87	oor	mmb		
ISSUE UPDATE							
REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
E1	J555	SJT	2/87	CR	ms		
F100 &F101 WAS 500MA							
REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
F1	J556	SJT	2/87	CR	Rmb		
PCB CHANGED TO -02 RN100 WAS 3W RESISTORS							

NOTE:
1. SIGNAL LEVELS MEASURED RELATIVE TO GROUND, UNBALANCED, WITH AMPLIFIER SET TO UNITY GAIN.
2. ALL RESISTORS ARE 1%, 1/8W UNLESS OTHER WISE SPECIFIED.
3. ARROWS INDICATE CLOCKWISE ROTATION.

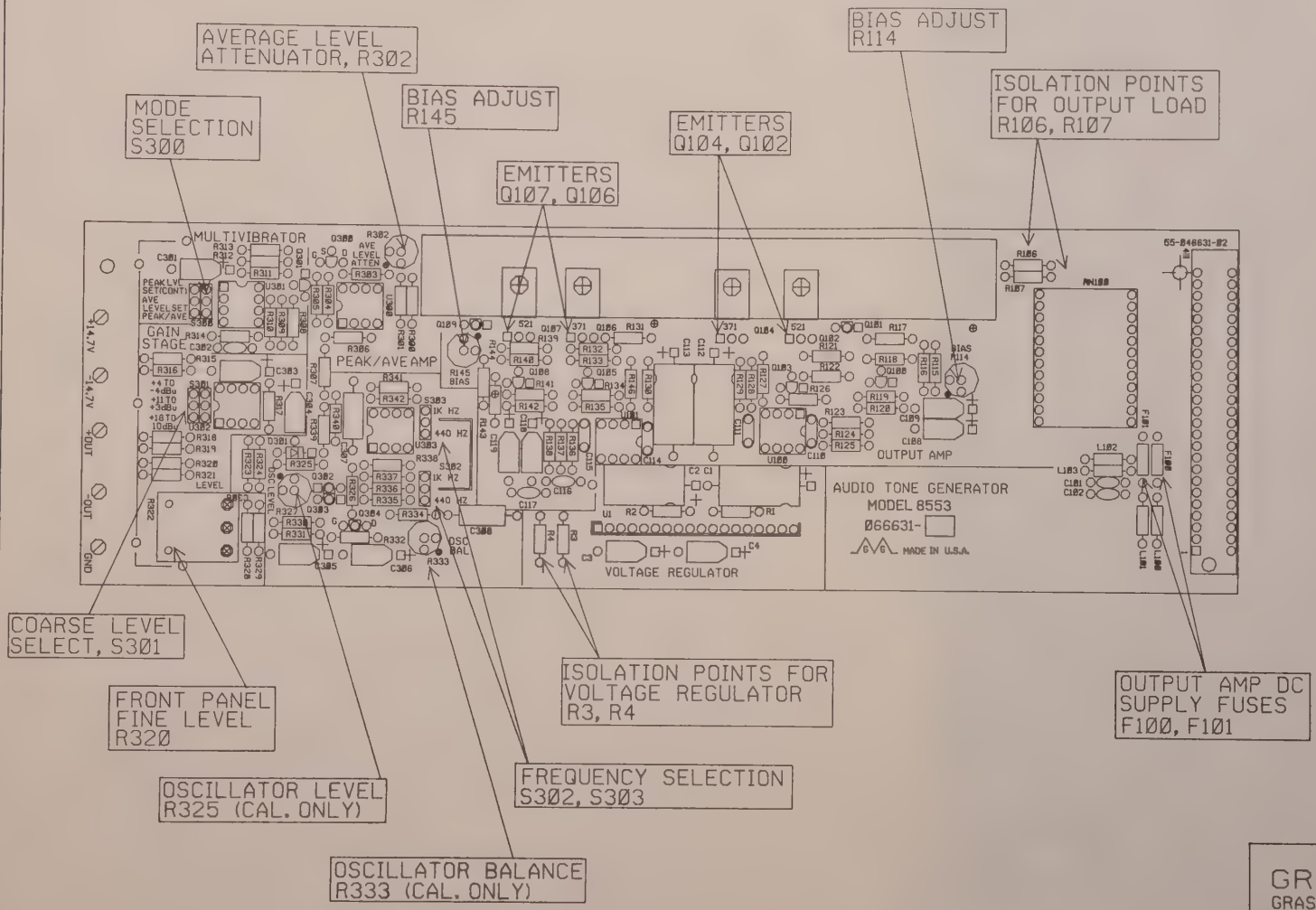
Grass Valley Group® — GRASS VALLEY CALIFORNIA — A TEKTRONIX COMPANY

DRAWN	SJT	29JAN86
ENGINEER	MMB	DATE
CHECKED		DATE
APPROVED	7hl/ 3may86	DATE
PILOT RUN RLSE	/mmb/ 27mar-86	DATE
ENGRG RLSE	/mmb/ 8aug86	DATE

SCHEMATIC
AUDIO TONE GENERATOR
MODEL 8553

SIZE D — DRAWING NO. D-10-066631-00 — REV F1
SCALE NONE — SHEET 1 OF 1

USED ON | NEXT ASSY | APPLICATION | DISTRIBUTION



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REVISIONS

REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
A1		SJT	3/86	ccr		bb	

PILOT RUN RELEASE

REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
B1	J350	SJT	5/86	ccr	mmb		

ADDED OSCILLATOR BALANCE, R333 (CAL. ONLY). PCB CHG TO -01

REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
B2		JPK	8/86	ccr	mmb		

ENGINEERING RELEASE

REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
C1	J475	SJT	1/87	ccr	mmb		

ISSUE UPDATE

REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
D1	J536	SJT	1/87	ccr	mmb		

ISSUE UPDATE

REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
E1	J555	SJT	2/87	ccr	mmb		

ISSUE UPDATE

REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
F1	J556	SJT	2/87	ccr	mmb		

PCB CHG TO -02 RN100 WAS 3W RES

GRASS VALLEY GROUP
GRASS VALLEY CALIFORNIA A TEKTRONIX COMPANY

DRAWN SJT 19MARCH86	COMPONENT LOCATION AUDIO TONE GENERATOR MODEL 8553
ENGINEER MMB	
CHECKED	
APPROVED /hl/ 30may86	SIZE B — DRAWING NO. 07-066631-00 — REV F1
PILOT RUN RLSE /mmb/ 27mar86	
ENGRG RLSE /mmb/ 8aug86	SCALE 1:1 — SHEET 1 OF 1

USED ON	NEXT ASSY
APPLICATION	
DISTRIBUTION	

8550 SWITCHING POWER SUPPLY

INTRODUCTION

The 8550PS is a high efficiency switching power supply which is capable of supplying up to eight audio DAs. The same supply can be used in the 2RU or the 1RU frames. Special current foldback and over-voltage protection circuits are used to protect the frame. Pre-regulation of the power supply voltage significantly reduces the total frame heat dissipation, especially during variations in load and input line voltage. The power supply is intended to supply ±16V at 2.5A 80W or ±12V at 1A 24W.

CIRCUIT DESCRIPTION

Refer to the 8550 schematic drawing D10-066546-00 while reading this description.

Input Filters and Transformer

The line voltage is reduced through the transformer located in the frame. Low voltage AC is fed to the power supply board through connector pins 27-30 and 43-46. AC ground is connected through connector pins 35-38. The AC voltage is rectified through diodes D3, D4, D5, D6. Fuses F1 and F2 protect the bridge and transformer from switcher failure. Electrolytic capacitors C2, C16 (positive) and C1, C22 (negative), filter the rectified AC, thus supplying the input DC to the switcher. A low pass filter composed of L1, C3, (positive) and L2, C4 (negative) isolates the transformer from the switcher and rejects high-frequency noise.

Positive Supply

The switcher operates as a step-down DC to DC converter. The step-down regulator converts higher input DC to lower output DC by chopping the nput DC via a transistor switch and filtering the resultant square wave through a low-pass filter. Switching action occurs as transistor Q4 switches on and off. Current flows through the Q4 when on, and through diode D9 when off. The square wave is first filtered through a low-pass filter comprised of L3, C17, and C18. A secondary filter, L4, C26, and C21, removes the remaining ripple. Overvoltage protection is provided by SCR Q2 and voltage reference zener D8. Silicon controlled rectifier Q2 will fire when the output voltage rises above the combined zener and gate voltage trigger point (approximately 18V). This will shunt the output voltage to ground through the SCR and enable the current foldback circuit or open the fuse, depending on the fault. Positioned at the output, Schottky diode D2 isolates this supply from a redundant supply, if used. When a dual power supply system is installed, these diodes ensure that should one supply lose power, it will be isolated and the second supply will take over.

Voltage control and current foldback are controlled by hybrid regulator U5 (HB-9053-00). Output voltage is referenced to a precision reference described in the Regulators and References section below.

Negative Supply

The negative supply is identical to the positive supply except for the following differences. Voltage control and current foldback is controlled by U6 (HB-9053-10) and the output voltage is referenced to the positive supply. Therefore the negative supply will track the positive supply but the positive supply will not track the negative supply.

Hybrid Regulator

The switching regulator hybrid contains the necessary circuitry to control: output voltage, current foldback, feedforward regulation, and to drive the switching transistors. The hybrid requires power to drive its internal circuits, clock pulses to initiate switching action, voltage reference to control the output voltage, and several circuit monitoring points for voltage regulation, current foldback, and feed forward regulation.

Regulators and References

The on-board regulators, U2 and U3, supply power to the clock generator, voltage reference, and hybrid control circuitry. They are also used as a reference for the current foldback circuit. Regulator U1 supplies a precision voltage reference for the positive supply. The reference is set to precisely one-half the switcher output voltage. The negative supply tracks the positive supply. The regulator voltages and references change levels depending on whether the switcher is to supply ±16V or ±12V. Connector pins 1, 3, and 5 program the intended use.

In the ±16V mode, the regulators supply ±18.75V and the voltage reference is +8.0V ±50mV. In the ±12V mode, the regulators supply ±15.1V and the voltage reference is +6.0V ±50mV. See adjustment section below for alignment procedure.

Clock Pulse Generator

The clock pulse generator supplies the necessary clock pulses to both hybrid regulators. Astable multivibrator U4 feeds zener D7 which ensures a constant pulse amplitude regardless of variations in the regulator voltages. The pulses are AC coupled through C15 to Q1. Transistor Q1 buffers and inverts the clock pulses.

ADJUSTMENTS

An extender board, audio frame, and a DC voltmeter are needed for these adjustments. Install the transformer in the frame. Place the power supply on the extender board. Plug the unit into AC power. Connect the voltmeter negative probe to the ground test point. Connect the voltmeter positive probe to the positive side of C10. Adjust R32 for +18.75V (±20mV). Connect the voltmeter positive probe to the negative side of C12. Adjust R31 for -18.75V (±20mV).

R E P L A C E M E N T P A R T S L I S T

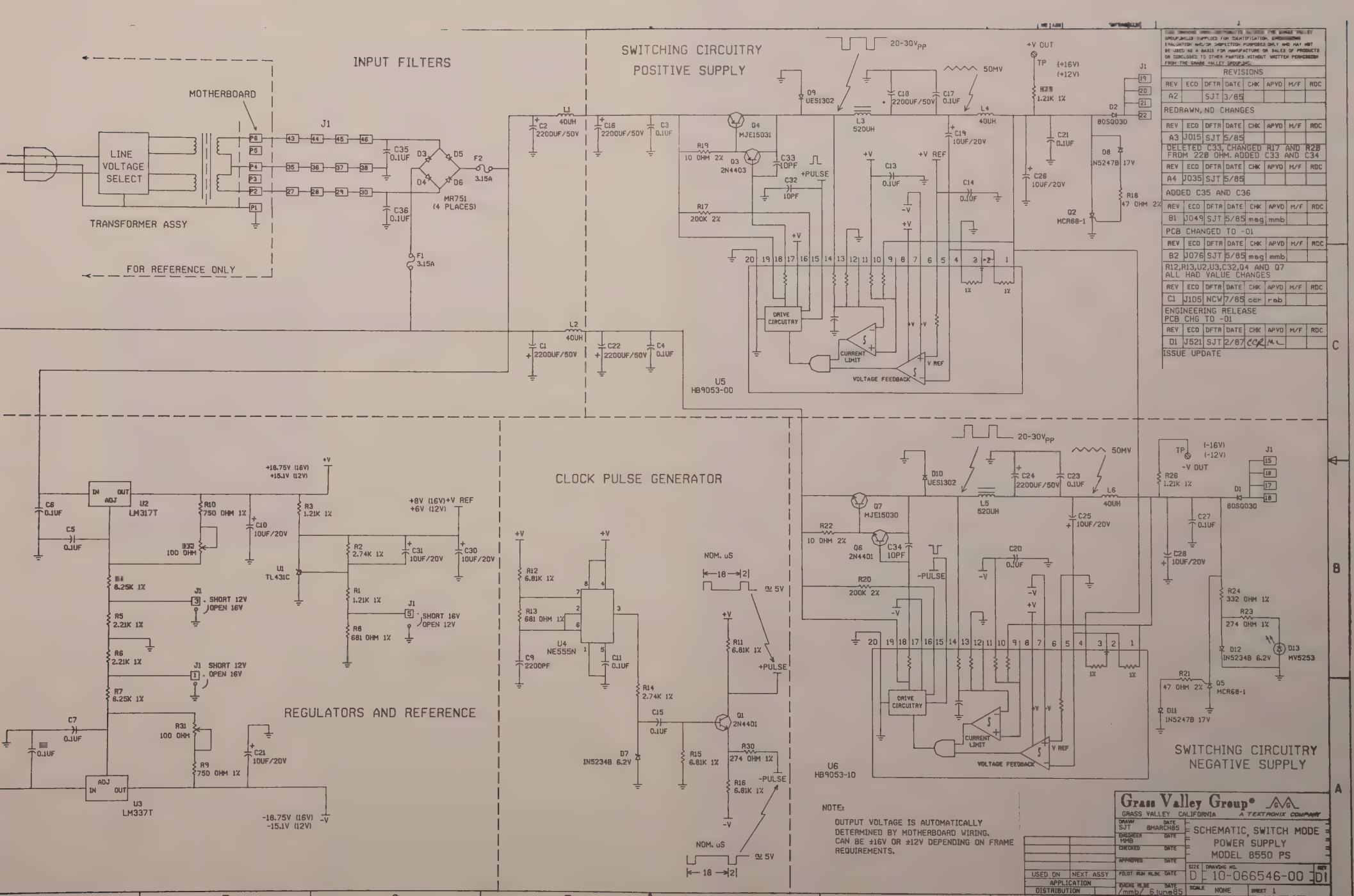
8550 SWITCHING PWR SUPPLY
ASSEMBLY NUMBER: 066546-00 ISSUE: D ECN: J521

ITM NO	REFERENCE DESIGNATOR	GVG PART NUMBER	DESCRIPTION MFG CODE/PART NUMBER	QTY
001		046546-02	PCB,8550 SWITCHING POWER SUPPLY	1
005	[C3,C4,C5,C6,C7,C8, C11,C13,C14,C15,C17, C20,C21,C23,C27,C35, C36]	CB0132-00	CAP,CER .1UF 20% 50WV Z5U AXIAL GVG/A70-CB0132-00 A1	17
007	[C9]	CB0133-00	CAP,CER 2200PF 10% 200WV X7R GVG/A70-CB0133-00 A2	1
008	[C32,C33,C34]	CB0139-00	CAP,CER 10PF 5% 200WV COG GVG/A70-CB0139-00 A3	3
010	[C1,C2,C16,C18,C22, C24]	CB1073-00	CAP,ALUM 2200UF -10%+30% 50WV GVG/A70-CB1073-00 A1	6
012	[C10,C12,C19,C25, C26,C28,C30,C31]	CB4029-00	CAP,TANT 10UF 10% 20WV GVG/A70-CB4029-00 A1	8
015	[D13]	SB1057-00	DIODE,LED 5306A12 GRN BRT RTANG PCB GVG/A70-SB1057-00 A1	1
016	[D3,D4,D5,D6]	SB2006-00	DIODE,RECT MR751 100V@6A 194 GVG/A70-SB2006-00 A1	4
018	[D7,D12]	SB4005-00	DIODE,ZENER 1N5234B 6.2V@20MA 400MW FAI/1N5234B	2
019	[D8,D11]	SB4039-00	DIODE,ZENER 1N5247B FAI/1N5247B	2
021	[D9,D10]	SB2032-00	DIODE,RECT UES1302 100V 6A FAST REC GVG/A70-SB2032-00 A1	2
022	[D1,D2]	SB2011-00	DIODE,RECT IR80SQ030 30V@5A 60 GVG/A70-SB2011-00 A1	2
025	[U6]	HB9053-00	HYBRID,SWITCHING REG POS SUPPLY GVG/HB9053-00	1
026	[U5]	HB9053-10	HYBRID,SWITCHING REG NEG SUPPLY GVG/HB9053-10	1
030	[U1]	SC0729-00	IC,LIN TL431CLP TO-92 GVG/A70-SC0729-00 A1	1
031	[U2]	SC0467-00	IC,LIN LM317T TO-220 GVG/A70-SC0467-00 A1	1
032	[U3]	SC0440-00	IC,LIN LM337T TO-220 GVG/A70-SC0440-00 A2	1
033	[U4]	SC0150-00	IC,LIN NE555N 8 DIP GVG/A70-SC0150-00 A1	1
037	[L1,L2,L4,L6]	ZB4056-00	INDCTR,40UH 3A 0.054 OHMS GOW/CA-402-1	4
038	[L3,L5]	055029-00	INDUCTOR 520 UH CLC/55029-00	2
042	[R31,R32]	PD2033-00	POT,TRIM CERMET 100 10% TOP BOR/3329H-1-101	2
045	[R19,R22]	RB2100-00	RES,10 OHM 2% 1/4W MTL FLM COR/C07 10R 2%	2
046	[R18,R21]	RB2470-00	RES,47 OHM 2% 1/4W MTL FLM COR/C07 47R 2%	2

R E P L A C E M E N T P A R T S L I S T

8550 SWITCHING PWR SUPPLY
ASSEMBLY NUMBER: 066546-00 ISSUE: D ECN: J521

ITM NO	REFERENCE DESIGNATOR	GVG PART NUMBER	DESCRIPTION MFG CODE/PART NUMBER	QTY
053	[R17,R20]	RB2204-00	RES,200K OHM 2% 1/4W MTL FLM COR/C07 200K 2%	2
057	[R23,R30]	RV2740-00	RES,274 OHM 1% 1/8W MTL FLM COR/CT4 274R 1%	2
058	[R24]	RV3320-00	RES,332 OHM 1% 1/8W MTL FLM COR/CT4 332R 1%	1
060	[R8,R13]	RV6810-00	RES,681 OHM 1% 1/8W MTL FLM COR/CT4 681R 1%	2
062	[R9,R10]	RV7500-00	RES,750 OHM 1% 1/8W MTL FLM COR/CT4 750R 1%	2
064	[R1,R3,R25,R26]	RV1211-00	RES,1.21K OHM 1% 1/8W MTL FLM COR/CT4 1.21K 1%	4
067	[R5,R6]	RV2211-00	RES,2.21K OHM 1% 1/8W MTL FLM COR/CT4 2.21K 1%	2
068	[R2,R14]	RV2741-00	RES,2.74K OHM 1% 1/8W MTL FLM COR/CT4 2.74K 1%	2
070	[R11,R12,R15,R16]	RV6811-00	RES,6.81K OHM 1% 1/8W MTL FLM COR/CT4 6.81K 1%	4
072	[R4,R7]	RV8251-00	RES,8.25K OHM 1% 1/8W MTL FLM COR/CT4 8.25 1%	2
075	[Q7]	SB7023-00	TRANS,NPN MJE15030 PWR TO-220 GVG/A70-SB7023-00 A1	1
076	[Q4]	SB7024-00	TRANS,PNP MJE15031 PWR TO-220 GVG/A70-SB7024-00 A1	1
078	[Q1,Q6]	SB8006-00	TRANS,NPN 2N4401 SM SIG TO-92 FAI/2N4401	2
079	[Q3]	SB8007-00	TRANS,PNP 2N4403 SM SIG TO-92 FAI/2N4403	1
081	[Q2,Q5]	SB9505-00	THYR,SCR MCR68-1 12A 25V TO-220A GVG/A70-SB9505-00 A1	2
085	[J1]	CF1462-00	CONN,RCPT,50POS 2 ROW PCB MNT AMP/534204-1	1
087	[F1,F2]	FB4065-00	FUSE,5X20MM SLO BLO 3.15 AMP BUS/GDC 3.15	2
088		FB4062-00	FUSE,HLDR 5MM PCB MNT GVG/A70-FB4062-00 A1	4
090		TA6059-00	TUR PN,.06X.1406 POST .0625 PCB GVG/A70-TA6059-00 A1	3
092		006529-00	HEAT SINK,TRANSISTOR,MONOPOLY	2
093		CC2048-00	CARD EJCTR,NYL WHT SNAP ON GVG/A70-CC2048-00 A1	1
094		HB2036-00	HEAT SINK,TO-220 WSHR W/THRM FLM BEQ/K4-54	2
097		SA1270-00	SCRW,4-40X.5L PCB PRESS STUD CFC/CKFH-440-8	4
098		WA2007-00	WSHR #4 SPLIT LOCK WASHER,#4,SPLIT RING,ZINC PL	4
099		NA4002-00	NUT #4-40 1/16x3/16 H NUT,4-40,.0625X.1875,HEX,ZINC PL	4


INPUT FILTERS
MOTHERBOARD
J1
LINE VOLTAGE SELECT
TRANSFORMER ASSY
FOR REFERENCE ONLY
C35 0.1UF
C36 0.1UF
D3
D4
D5
D6
MR751 (4 PLACES)
F2 3.15A
F1 3.15A
SWITCHING CIRCUITRY POSITIVE SUPPLY
20-30VPP
50MV
+V OUT
TP (+16V) (+12V)
1.21K 1%
D9 UES1302
L1 40UH
L2 40UH
L3 520UH
L4 40UH
C2 2200UF/50V
C16 2200UF/50V
C3 0.1UF
C18 2200UF/50V
C17 0.1UF
C19 10UF/20V
C21 0.1UF
C26 10UF/20V
D2 80SQ030
D8 1N5247B 17V
R18 47 OHM 2%
Q2 MCR68-1
R19 10 OHM 2%
Q3 2N4403
C33 10PF
C32 10PF
+PULSE
+V REF
C13 0.1UF
C14 0.1UF
R17 200K 2%
C1 2200UF/50V
C22 2200UF/50V
C4 0.1UF
DRIVE CIRCUITRY
CURRENT LIMIT
V REF
VOLTAGE FEEDBACK
U5 HB9053-00
REVISIONS
REV ECO DFTR DATE CHK APVD M/F RDC
A2 SJT 3/85
REDRAWN, NO CHANGES
A3 J015 SJT 5/85
DELETED C33, CHANGED R17 AND R28 FROM 220 OHM. ADDED C33 AND C34
A4 J035 SJT 5/85
ADDED C35 AND C36
B1 J049 SJT 5/85 mag mmb
PCB CHANGED TO -01
B2 J076 SJT 5/85 mag mmb
R12,R13,U2,U3,C32,Q4 AND Q7 ALL HAD VALUE CHANGES
C1 J105 NCW 7/85 ccr rab
ENGINEERING RELEASE PCB CHG TO -01
D1 J521 SJT 2/87 CCR MC
ISSUE UPDATE
REGULATORS AND REFERENCE
+18.75V (16V) +15.1V (12V)
U2 LM317T
R10 750 OHM 1%
100 OHM
C10 10UF/20V
R3 1.21K 1%
+8V (16V)+V REF +6V (12V)
R2 2.74K 1%
C31 10UF/20V
C30 10UF/20V
U1 TL431C
R1 1.21K 1%
R6 681 OHM 1%
C6 0.1UF
C5 0.1UF
8.25K 1%
R5 2.21K 1%
R6 2.21K 1%
R7 8.25K 1%
J1 SHORT 12V OPEN 16V
J1 SHORT 16V OPEN 12V
J1 SHORT 12V OPEN 16V
C7 0.1UF
0.1UF
R31 100 OHM
R9 750 OHM 1%
C21 10UF/20V
U3 LM337T
-18.75V (16V) -15.1V (12V)
CLOCK PULSE GENERATOR
R12 6.81K 1%
R13 681 OHM 1%
U4 NE555N
C9 2200PF
C11 0.1UF
R14 2.74K 1%
C15 0.1UF
D7 1N5234B 6.2V
R15 6.81K 1%
Q1 2N4401
R11 6.81K 1%
R30 274 OHM 1%
R16 6.81K 1%
NOM. uS
≃ 5V
18
2
SWITCHING CIRCUITRY NEGATIVE SUPPLY
20-30VPP
50MV
D10 UES1302
L5 520UH
L6 40UH
C24 2200UF/50V
C23 0.1UF
C25 10UF/20V
Q7 MJE15030
R22 10 OHM 2%
Q6 2N4401
C34 10PF
R20 200K 2%
-PULSE
C20 0.1UF
U6 HB9053-10
TP (-16V) (-12V)
-V OUT
R26 1.21K 1%
D1 80SQ030
C27 0.1UF
C28 10UF/20V
R24 332 OHM 1%
R23 274 OHM 1%
D12 1N5234B 6.2V
D13 MV5253
R21 47 OHM 2%
Q5 MCR68-1
D11 1N5247B 17V
NOTE:
OUTPUT VOLTAGE IS AUTOMATICALLY DETERMINED BY MOTHERBOARD WIRING. CAN BE ±16V OR ±12V DEPENDING ON FRAME REQUIREMENTS.
Grass Valley Group
GRASS VALLEY CALIFORNIA
A TEKTRONIX COMPANY
DRAWN SJT 8MARCH85
ENGINEER MMB
CHECKED
APPROVED
SCHEMATIC, SWITCH MODE POWER SUPPLY MODEL 8550 PS
USED ON NEXT ASSY
APPLICATION
DISTRIBUTION
PILOT RUN RLSE
ENGNG RLSE mmb 6 June 85
SIZE D
DRAWING NO. 10-066546-00
REV D1
SCALE NONE
SHEET 1

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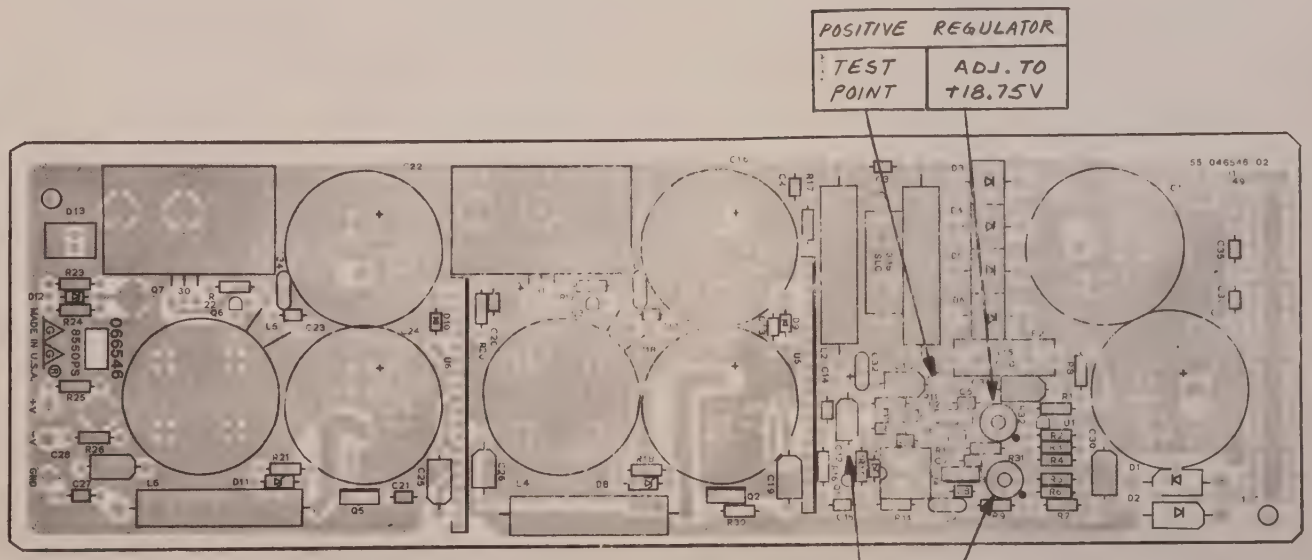
REVISIONS

REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
A1	–	SJT	3/85	MMB	MMB		
PILOT RUN RELEASED							
B1	J049	SJT	5/85	MMB	MMB		
PCB CHANGED TO -01							
C1	J105	NCW	7/23/85	MMB	MMB		
ENG. RELEASED, PCB CHANGED TO -02							
D1	J521	SJT	2/87	CCR	NC		
ISSUE UPDATE							



MODULAR PRODUCTS

GRASS VALLEY GROUP
GRASS VALLEY CALIFORNIA — A TEKTRONIX COMPANY

DRAWN NCW	DATE JUNE 30 86	COMPONENT LOCATION MODEL 8550 SWITCH MODE-P./S.
ENGINEER MMB		
CHECKED JPK	DATE	
APPROVED	DATE June 30 86	
ENGRG RLSE MMB	DATE 25 June 86	SIZE B — DRAWING NO. 07-066546-00 — REV D1
USED ON / NEXT ASSY		SCALE: — SHEET 1 OF 1
APPLICATION		
DISTRIBUTION		

BRUNING 40-522 53620-2

TRAY DESCRIPTION

The 8550 Series uses two standard trays which are designed for mounting in 19 inch racks.

The 1 rack-unit tray, 8550T1, will accept up to four 8550 Series DA modules and one power supply. The 2 rack-unit tray, 8550T2, will accept up to eight 8550 Series DA modules and one or two power supplies. See Figure 1.

For wiring details refer to drawing numbers D11-096362-00 (1RU) and D11-096363-00 (2RU).

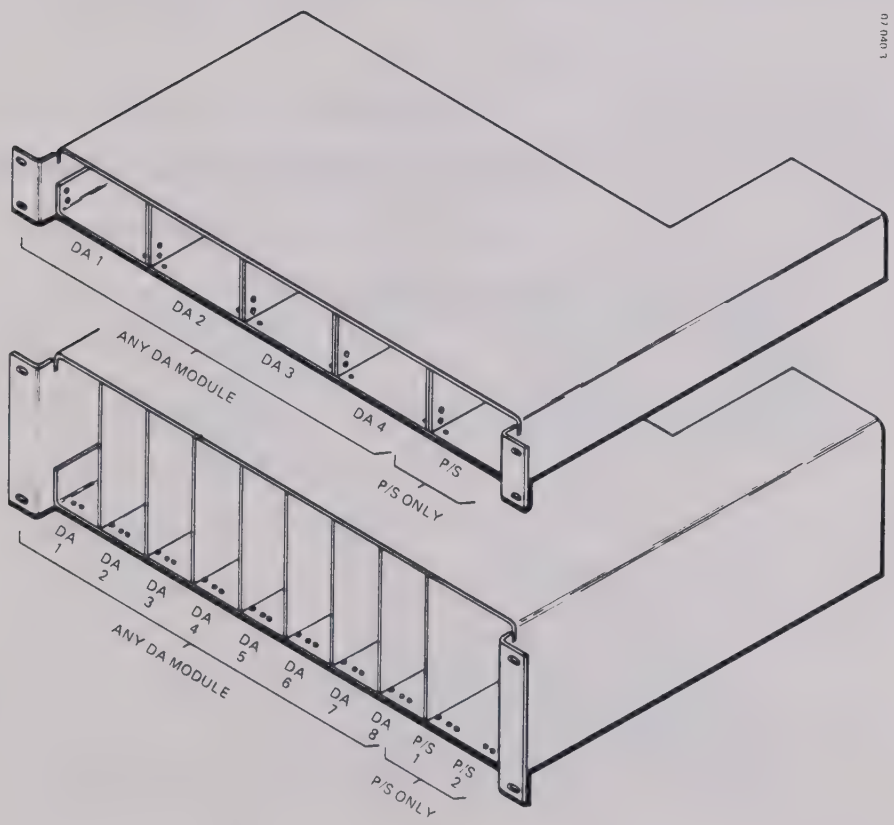


Figure 1. Module Locations In 8550 Series Trays

POWER SUPPLY DESCRIPTION

The 8550 series power supply section is composed of:

1. A line transformer assembly mounted in the rear of the frame (see Table 1 for assembly numbers and line voltages);

2. A power supply module which is mounted in the front of the tray. The transformer assembly supplies a nominal 48VAC (center tapped) to the power supply which then rectifies, filters, and regulates the voltage to +/-16VDC. See Power Supply section for a detailed description of the power supply.

Each 8550 series power supply is capable of powering a full 2RU tray of eight 8550 series modules. When a second power supply is installed, diode OR circuitry supplies automatic power supply backup.

LINE VOLTAGE SELECTION

There are four transformer assemblies available. All the transformers operate on 50-60Hz and use slow-blow fuses.

Assembly #	Line Voltage	RU	Fuse
073636-00	90-130VAC	1	1.0 Amp
073636-20	90-130VAC	2	2.5 Amp
073636-10	180-260VAC	1	0.5 Amp
073636-30	180-260VAC	2	1.0 Amp

TABLE 1.

CAUTION

Ensure that the fuse is correct for the required voltage range. An in correct fuse may allow damage to the electronics.

LINE VOLTAGE MODIFICATION

8550 series trays are shipped with the transformer voltage ordered. Check the label on the transformer assembly for operating voltage. If the unit is required to operate at a different range, it will be necessary to order a replacement transformer or to rewire the existing transformer assembly. The directions below give the steps necessary for changing a lower voltage to a higher voltage transformer or visa versa.

Rewiring Instructions

To disassemble and assemble the transformer assembly, refer to the exploded view of the transformer assembly in Figure 2.

Figure 3 shows how the transformer assemblies may be rewired to change the voltage ranges. To make wiring changes, follow these steps:

1. Remove power cord (A) from receptacle.
2. Remove transformer assembly retaining cover (B).
3. Slide transformer assembly (C) out of tray.
4. Remove top cover (D) on transformer assembly. Note that the 2RU transformer uses a slightly different top cover than the 1RU top cover shown in Figure 2.
5. Rewire for desired voltage range. (See Figure 3, page 5).
6. Replace fuse (E) with correct rating.
7. Mark voltage labels (F) to indicate new voltage range.
8. Check your wiring and then replace top cover (D) on transformer assembly.
9. Slide assembly (C) into tray.
10. Replace retaining cover (B). After ensuring that the power cord plug is the correct voltage configuration, install the power cord (A).

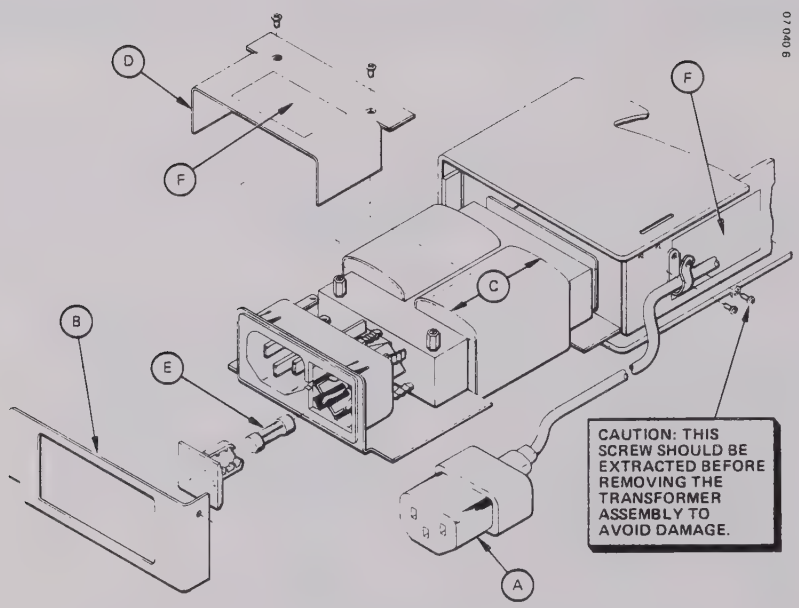
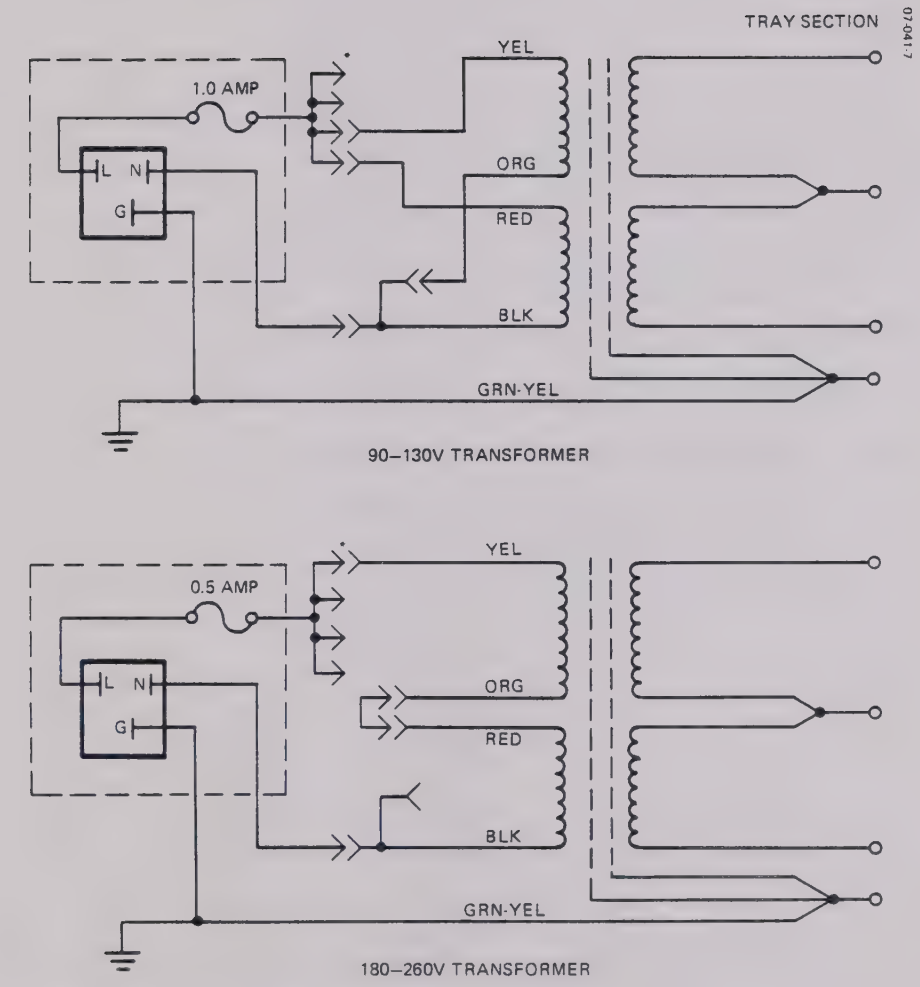


Figure 2. Transformer Assembly
Note: Two rack-unit similar to
one rack-unit pictured above.



*LEGEND NUMBERS (i.e. 240, 120 DON'T REFLECT VOLTAGE SETTINGS.)

Figure 3. Transformer Wiring Diagram

R E P L A C E M E N T P A R T S L I S T

8500,XFMR ASSY 1RU AUDIO,120V
ASSEMBLY NUMBER: 073693-00 ISSUE: D ECN: J552

ITM NO	REFERENCE DESIGNATOR	GVG PART NUMBER	DESCRIPTION MFG CODE/PART NUMBER	QTY
001		006520-03	MOUNT,X FORMER OUTPUT	1
002		006519-01	MOUNT,X FORMER VIDEO INPUT	1
003		006521-01	COVER POWER PLUG	1
005		CF0744-00	CONN,RCPT FUSE HLDR PNL MNT GVG/A70-CF0744-00 A1	1
006		CF0743-00	CONN,RCPT FOR .080 PIN TA6123-00 CAM/450-3374-01-03-12	4
008		TA6126-00	TERM,PL FASTON INSUL 22-18 AWG GVG/A70-TA6126-00 A1	1
009		TA6125-00	TERM,RCPT FASTON INSUL 22 AWG AMP/2-520337-2	5
012		058371-00	LABEL,VOLTAGE AUDIO TRANSFMR ASSY	1
013		058372-00	LABEL,CAUTION POWER ENTRY XFMR ASSY	1
014		058375-00	LABEL,FUSE COVER DUAL RANGE 1A .5A	1
016		FB4058-00	FUSE,5X20MM SLO BLO 1 AMP BUS/GDC-1	1
017		TB6056-00	XFMR,PWR 115/230V 40VCT 37VA GVG/A70-TB6056-00 A3	1

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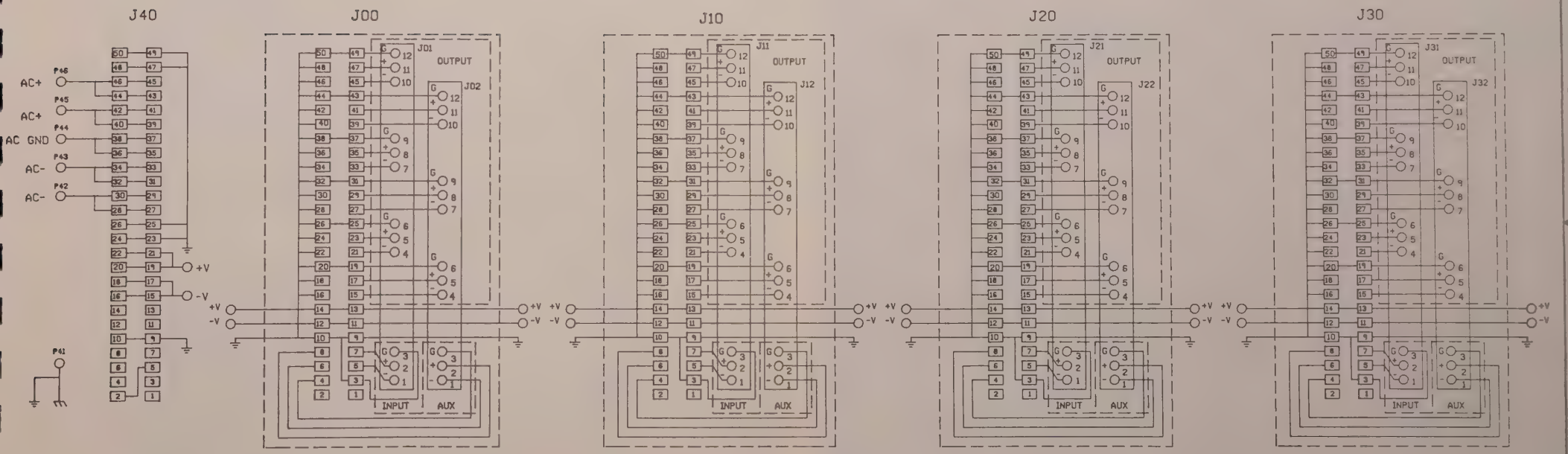
REVISIONS

REV	ECO	DFTR	DATE	CHK	APVD	M/F	RDC
A1	J329	SJT	3/86				
PILOT RUN RELEASE							
A2	J318	SJT	4/86	CR		WB	
PART NO. CHANGE FROM 866531-88							



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A TEKTRONIX COMPANY

DRAWN	SJT 28MARCH86
ENGINEER	MMB
CHECKED	
CHECKED	
SHEET RUN RLSE	
SHEET RLSE	

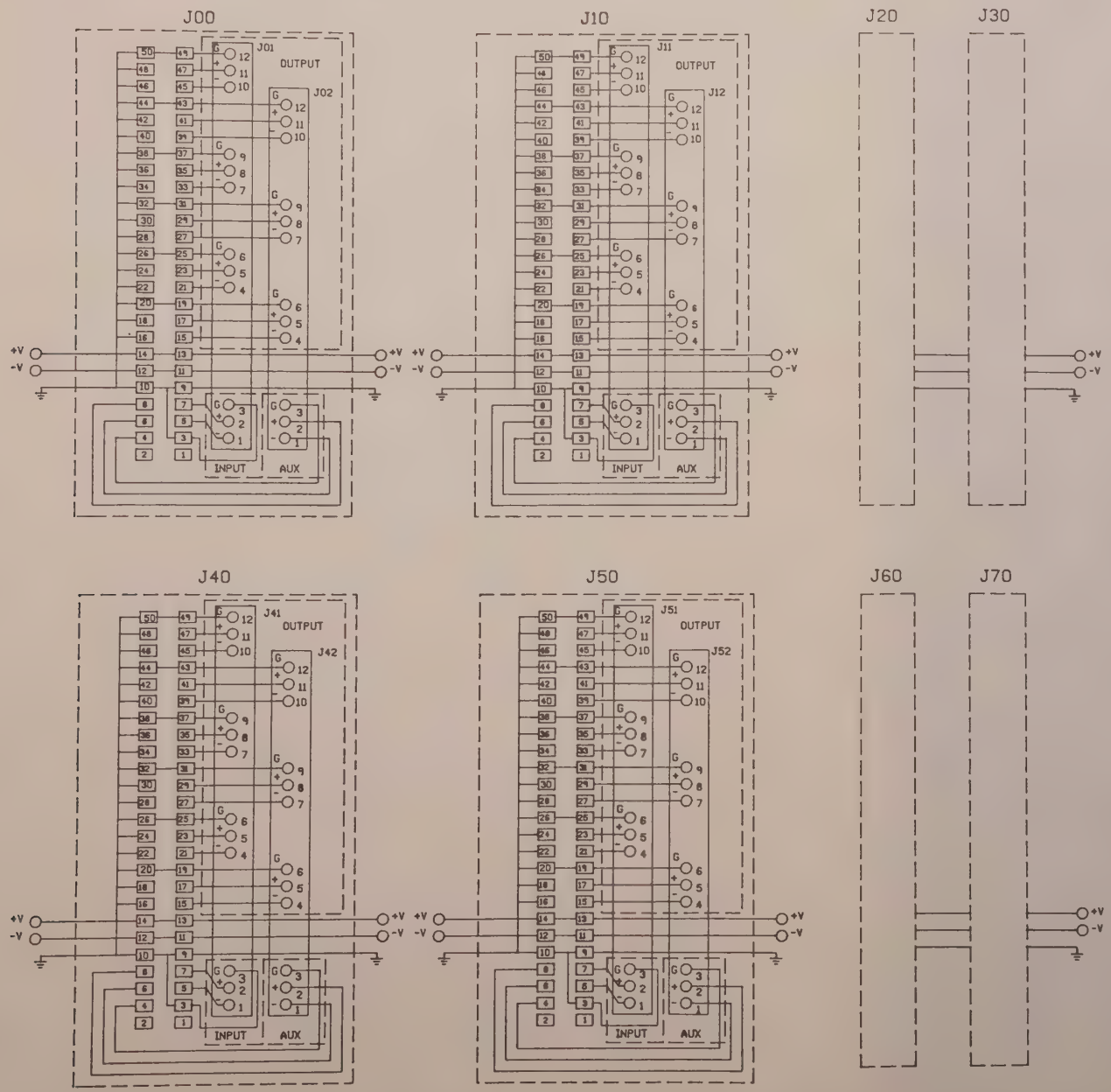
SCHEMATIC, 1RU
AUDIO MOTHER BD

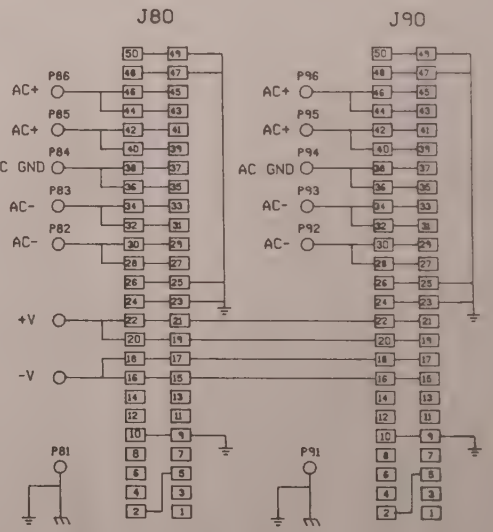
USED ON	NEXT ASSY
APPLICATION	
DISTRIBUTION	

066531

SIZE D | DRAWING NO. 10-096362-01 | REV A2

SCALE NONE | SHEET 1





REVISIONS							
REV	ECO	DFTR	DATE	CHK	APVD	M/F	ADC
A1	J255	SJT	3/86				
PILOT RUN RELEASE							
REV	ECO	DFTR	DATE	CHK	APVD	M/F	ADC
A2	J310	SJT	4/86				
PART NO. CHANGE FROM 866532-BB							
REV	ECO	DFTR	DATE	CHK	APVD	M/F	ADC

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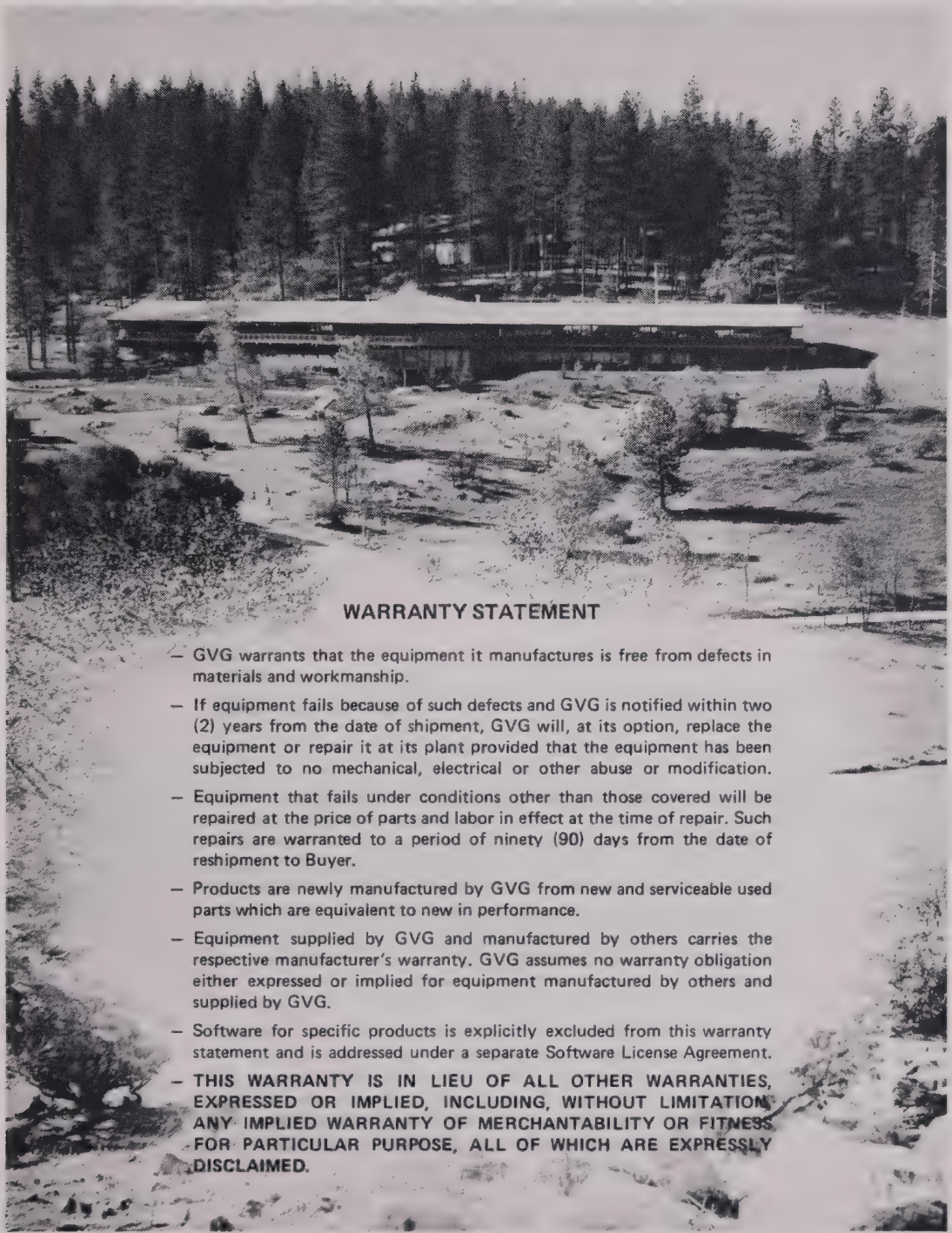
ENGINEER	MMB
CHECKED	
APPROVED	
MFG ENGR	
QUALITY	

SCHEMATIC, 2RU
AUDIO MOTHER BD

866532		
USED ON	NEXT ASSY	
APPLICATION		
DISTRIBUTION		

SIZE D | DRAWING NO. 10-096363-02 | REV A2
SCALE NONE | SHEET 1



WARRANTY STATEMENT

- GVG warrants that the equipment it manufactures is free from defects in materials and workmanship.
- If equipment fails because of such defects and GVG is notified within two (2) years from the date of shipment, GVG will, at its option, replace the equipment or repair it at its plant provided that the equipment has been subjected to no mechanical, electrical or other abuse or modification.
- Equipment that fails under conditions other than those covered will be repaired at the price of parts and labor in effect at the time of repair. Such repairs are warranted to a period of ninety (90) days from the date of reshipment to Buyer.
- Products are newly manufactured by GVG from new and serviceable used parts which are equivalent to new in performance.
- Equipment supplied by GVG and manufactured by others carries the respective manufacturer's warranty. GVG assumes no warranty obligation either expressed or implied for equipment manufactured by others and supplied by GVG.
- Software for specific products is explicitly excluded from this warranty statement and is addressed under a separate Software License Agreement.
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Your opinions are valuable to us. We are continually seeking to improve our products and your feedback on this particular product line will enable us to accomplish our goal. Please use this postage-paid card to **express yourself.**

Give us your feedback on the existing product line:

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What new products in this line would be useful for your particular needs?

_____

_____

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Name_____ Company/Station_____

City_____ State_____ Zip or Country_____

GVG FORM 2033a R1 8-86

MANUAL UPDATE ORDER CARD

Because GVG will be updating this product line, not every new module may be included in this manual. If you have subsequently purchased a module(s) which is not documented in this issue of the manual, you are entitled to a new manual covering that product(s). Please use this postage-paid card to order your additional documentation.

Please send me a manual documenting the following new modules:

_____

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Name_____ Company/Station_____

Street_____ Title_____

City_____ State_____ Zip or Country_____

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The Grass Valley Group Inc.
PO Box 1114 Grass Valley California 95945 USA
Tel (916) 273-8421 TRT 160432

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